PB81-111452

APTI (Air Pollution Training Institute)
Course 444. Air Pollution Field Enforcement
Student Workbook

(U.S.) Environmental Protection Agency
Research Triangle Park, NC

Mar 80

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Air Pollution Training Institute
MD 20
Environmental Research Center
Research Triangle Park NC 27711

EPA 450/2-80-076
March 1980

Air

PB81-111452

EPA

APTI
Course 444
Air Pollution Field Enforcement

Student Workbook

P.O.570

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA 450/2-80-076	2.	3. RECIPIENT'S ACCESSION NO. PB81 111452
4. TITLE AND SUBTITLE APTI Course 444 Air Pollution Field Enforcement Student Workbook		5. REPORT DATE March 1980
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) C. W. Gruber, P. M. Giblin		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO. B18A2C
		11. CONTRACT/GRANT NO. 68-02-3014
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Manpower and Technical Information Branch Air Pollution Training Institute Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Student Workbook
		14. SPONSORING AGENCY CODE EPA-OANR-OAQPS

15. SUPPLEMENTARY NOTES

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16. ABSTRACT

This document is part of an overall package of training materials to be used in presenting the Air Pollution Training Institute Course 444. The course is designed for governmental air pollution control personnel who do field inspection and enforcement work. The workbook contains printed materials needed to do classroom exercises recording visible emission violations and preparation of a notice of violation thereon; conducting inspections of industrial facilities; preparation of cases for prosecution in court and acting as a witness in a court case; and handling public complaints about air pollution.

This student workbook is used in conjunction with the Instructor's Guide (EPA 450/2-80-077) and the Student Manual (EPA 450/2-80-075).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Education	Training course	13 B
Manuals	Student Workbook	5 I
Air Pollution		68 A

18. DISTRIBUTION STATEMENT Unlimited Available from National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (9-73)

United States
Environmental Protection
Agency

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March 1980

Air

APTI
Course 444
Air Pollution Field Enforcement

Student Workbook

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Notice

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This document is issued by the Manpower and Technical Information Branch, Control Programs Development Division, Office of Air Quality Planning and Standards, USEPA. It was developed for use in training courses presented by the EPA Air Pollution Training Institute and others receiving contractual or grant support from the Institute. Other organizations are welcome to use the document for training purposes.

Schools or governmental air pollution control agencies establishing training programs may receive single copies of this document, free of charge, from the Air Pollution Training Institute, USEPA, MD-20, Research Triangle Park, NC 27711. Others may obtain copies, for a fee, from the National Technical Information Service, 5825 Port Royal Road, Springfield, VA 22161.

AIR POLLUTION TRAINING INSTITUTE
MANPOWER AND TECHNICAL INFORMATION BRANCH
CONTROL PROGRAMS DEVELOPMENT DIVISION
OFFICE OF AIR QUALITY PLANNING AND STANDARDS

The Air Pollution Training Institute (1) conducts training for personnel working on the development and improvement of state, and local governmental, and EPA air pollution control programs, as well as for personnel in industry and academic institutions; (2) provides consultation and other training assistance to governmental agencies, educational institutions, industrial organizations, and others engaged in air pollution training activities; and (3) promotes the development and improvement of air pollution training programs in educational institutions and state, regional, and local governmental air pollution control agencies. Much of the program is now conducted by an on-site contractor, Northrop Services, Inc.

One of the principal mechanisms utilized to meet the Institute's goals is the intensive short term technical training course. A full-time professional staff is responsible for the design, development, and presentation of these courses. In addition the services of scientists, engineers, and specialists from other EPA programs, governmental agencies, industries, and universities are used to augment and reinforce the Institute staff in the development and presentation of technical material.

Individual course objectives and desired learning outcomes are delineated to meet specific program needs through training. Subject matter areas covered include air pollution source studies, atmospheric dispersion, and air quality management. These courses are presented in the Institute's resident classrooms and laboratories and at various field locations.

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TABLE OF CONTENTS

		Page
EXERCISE NO. 1	Section 1, Off-site Surveillance (Opacity Violation of Incinerator)	1-4
	Section 2, On-site Inspection (Follow up of Section 1)	1-9
EXERCISE NO. 2	Inspection of a Cement Plant	2-1
EXERCISE NO. 3	Trial of Opacity and TSP Violations	3-1
EXERCISE NO. 4	Complaint Handling -- Odor Complaint Case Study	4-1
EXERCISE NO. 5	Complaint Inspection of an Asphalt Concrete Batching Plant	5-1
EXERCISE NO. 6	Inspection of Combustion Sources	6-1

STUDENT EXERCISE NO. 1

OPACITY VIOLATION

STUDENT EXERCISE NO. 1

HENDERSON COUNTY, STATE OF OHIO

SECTION I (LESSON 4) - OPACITY VIOLATION, OFF-SITE SURVEILLANCE

SECTION II (LESSON 5) - ON-SITE INSPECTION, FOLLOWING OPACITY OBSERVATION

GOAL. Practice in the application of principles taught during the day.

OBJECTIVES. At the end of this exercise, the student should have demonstrated his ability to:

1. Read and apply rules and regulations which are not familiar to the student.
2. Objectively determine, from given data on a series of opacity readings, that a violation, in fact, has occurred and relate such observation to the Rules and Regulations violated.
3. Write a notice of violation of a visible emission rule.
4. Determine the information to be obtained during the on-site inspection.
5. Identify errors in a poorly conducted on-site inspection.
6. Identify all potential violations discovered during the on-site inspection.
7. Write a report documenting the on-site inspection.

INSTRUCTIONS. The Exercise has two sections:

Section I follows Lesson 4 and Section II follows Lesson 5.

Because of the time limitations, carefully abide by the following instructions:

1. Work as a team of two or three to be assigned.
2. Read the case history and do the work called for in the case study.

3. Only one completed answer sheet is required for each Team. All members should sign to record their participation.

4. Following each Lesson (4 and 5), forty (40) minutes will be allotted to complete the answer sheets.

5. After 40 minutes, the instructor will call for reports - question by question - at random from the various Teams. The spokesman will respond.

6. Each point will be discussed.

7. At the completion of Section I and Section II, an answer sheet will be available to each student to compare against the work of his team.

8. Collection of the reports for review by the instructor is optional. If collected, the Team Reports should be returned the next day.

STUDENT EXERCISE NO. 1

SECTION I - (LESSON 4)

OPACITY VIOLATION

HENDERSON COUNTY, OHIO.

OFF-SITE SURVEILLANCE

This case study of a multiple-chamber incinerator smoke violation describes the observation of the emissions, entry of the facility, and inspection of the equipment. Carefully read the following material. Do the assignment required for each lesson. Use Section II, Rules and Regulations, as applying to this source.

Inspector John Hubbard, who has been with his agency for six months, is patrolling Sector 2, the southeastern part of Henderson County, Ohio on July 15, 1978. At 8:10 A.M. he observes a plume of black smoke located approximately one mile to the east of his vehicle. Traveling east, he is soon able to park his car approximately 75 feet west of the source of the plume. Hubbard notes a large sign painted on the side of the building reading "Johnson Storage Co". The source turns out to be a small multiple-chamber incinerator having an approximately 1 ft. diameter x 12 ft. high steel stack equipped with a spark arrestor. The incinerator is located in the rear of a three-story brick building that appears to be a warehouse. The wind is from the south at approximately five miles per hour.

The inspector gets out of his car and stands alongside of it. Using his own watch and a stop watch, he begins to record his observations of the emissions as of 8:15 on the agency observation form. The results of the observation are shown on the following page.

The incinerator is unattended during the entire observation. In fact, no one is present in the yard, and the premises appear to be abandoned. He notices two 50-gallon oil drums near the incinerator, but from his vantage point, he cannot see the contents.

At this point begin the exercise for Lesson 4. Except for the reference to the appropriate regulations, do not read the case beyond this point as time is limited and the actions and reactions to the questions will lose their realism if such is done.

Each team is required to submit one copy of the following assignments, completed and signed by each member of the team.

1. Complete the Visible Emission Observation Form using the data given in the case narrative report. If any necessary information was omitted in the description of Hubbard's actions, make reasonable assumptions which would validate the visible emission observation results. Circle or underline assumed data.

2. Enter on the front of the "Notice of Violation" form only that data which is valid to this point.

3. State the Rule violated and duration of the violation.

4. Decide on the on-site inspection strategy.

   On the answer sheet write the three most important pieces of information to be obtained during the inspection.

4. State three important pieces of information which are necessary to complete the documentation of this opacity violation to be obtained during the on-site inspection.

VISIBLE EMISSION OBSERVATION FORM

Source Name ____________________ Observer ____________________

Address ____________________ Date ____________________

Observation Point: ____________________

Stack: Distance From ____ Height ________

Wind: Speed ________ Direction ________

Sky Condition: ____________________

Color of Emission: ____________________

Ambient Temp: Dry Bulb ______ °F
Wet Bulb ______ °F

Relative Humidity: __________

Observation began ______ Ended ______

Observer's Signature:

Certification Date: ____________________

Comments:

	0	15	30	45		0	15	30	45
0					30				
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15	5	5	5	5	45				
16	5	5	5	5	46				
17	5	4	4	4	47				
18	4	4	4	4	48				
19	4	4	4	4	49				
20	4	4	4	4	50				
21	4	4	3	3	51				
22	2	2	2	2	52				
23	1	1	1	1	53				
24	1/2	1/2	1/2	1/2	54				
25	1/2	1/2	1/2	1/2	55				
26	1/2	1/2	1/2	1/2	56				
27	0	0	0	0	57				
28					58				
29					59				

STUDENT EXERCISE NO. 1

SECTION I (LESSON 4)

ANSWER SHEET

TEAM ____________________

MEMBERS SIGN:

____

____

____

____

1. Completed Visible Emission Observation Form. Do not turn in.

2. Enter on the Notice of Violation Form that information which is valid to this point in time.

3. The rule violated was ________ ____________

   Aggregate (length) of violation ____________________ minutes

4. The on-site inspection should produce the following information to complete the documentation of this violation.

   1. ____________________

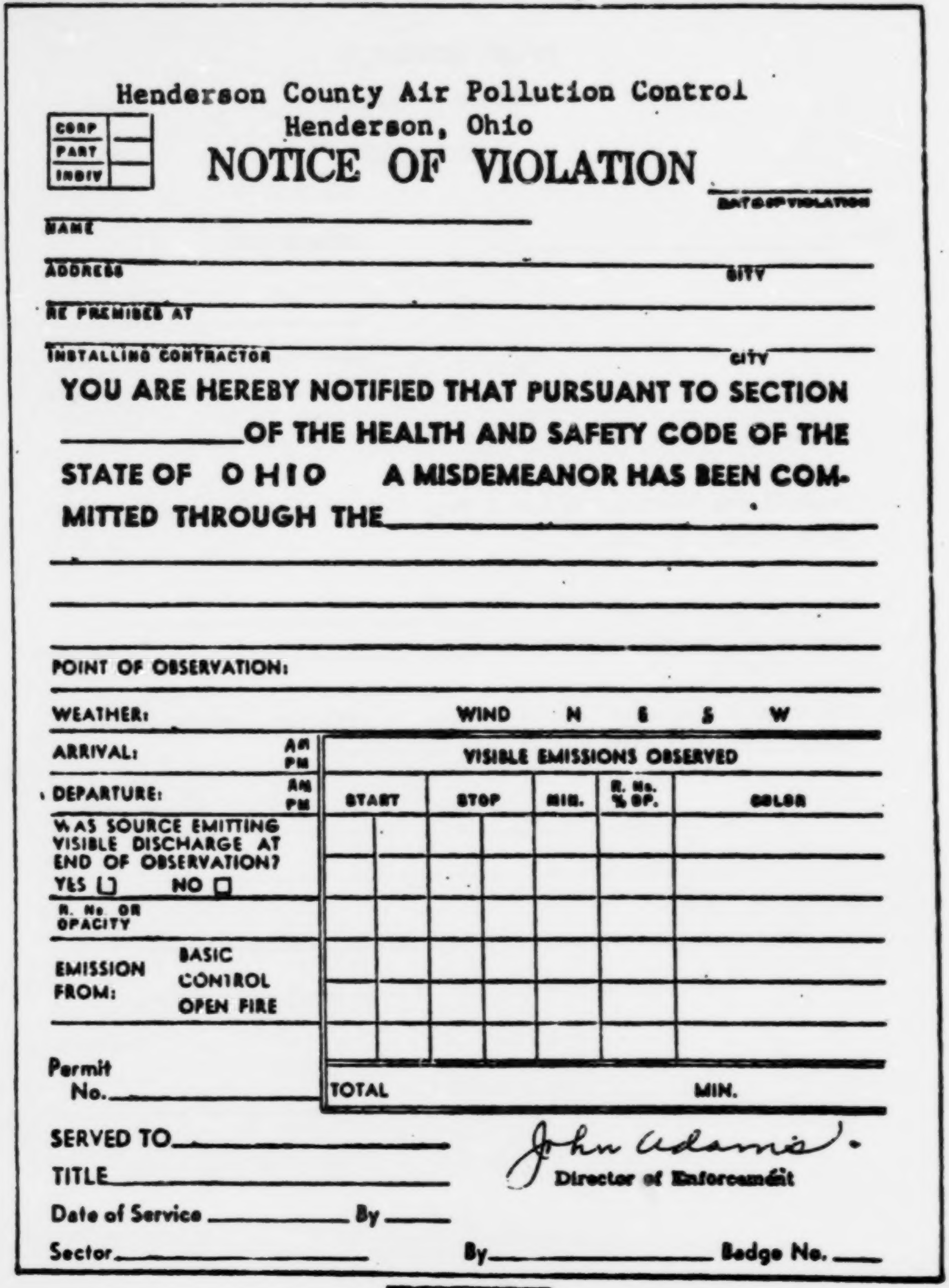
      ____

   2. ____________________

      ____

   3. ____________________

      ____



Henderson County Air Pollution Control
Henderson, Ohio

CORP	
PART	
INDIV	

NOTICE OF VIOLATION

______ DATE OF VIOLATION

______ NAME

______ ADDRESS ______ CITY

______ RE PREMISES AT

______ INSTALLING CONTRACTOR ______ CITY

YOU ARE HEREBY NOTIFIED THAT PURSUANT TO SECTION ______ OF THE HEALTH AND SAFETY CODE OF THE STATE OF OHIO A MISDEMEANOR HAS BEEN COMMITTED THROUGH THE ______

POINT OF OBSERVATION:

WEATHER: WIND N E S W

ARRIVAL: AM PM

DEPARTURE: AM PM

WAS SOURCE EMITTING VISIBLE DISCHARGE AT END OF OBSERVATION? YES ☐ NO ☐

R. No. OR OPACITY

EMISSION FROM: BASIC
CONTROL
OPEN FIRE

Permit No. ______

VISIBLE EMISSIONS OBSERVED						
START		STOP		MIN.	R. No. % OP.	COLOR
TOTAL					MIN.	

SERVED TO ______

TITLE ______

Date of Service ______ By ______

Sector ______ By ______ Badge No. ______

John Adams
Director of Enforcement

FRONT

STUDENT EXERCISE NO. 1 (CONT'D)

SECTION II (LESSON 5)

OPACITY VIOLATION

HENDERSON COUNTY, OHIO

ON-SITE INSPECTION

CONTINUATION OF HENDERSON COUNTY OPACITY VIOLATION

After completing his pre-entry surveillance, Hubbard drives to the front of the plant and parks his car and enters the premises.

Inside, he meets a receptionist, identifies himself and his agency, and asks to see the owner of the company. She replies that the owners are not present, as the headquarters office of the company is located in Chicago, Illinois, and asks what it is he wants. Hubbard replies that the incinerator appears to be in violation. Thereupon, the receptionist directs him to see the bookkeeper, Mr. Peterson.

She rings Mr. Peterson who presently arrives. After a quick introduction, the inspector informs Mr. Peterson that he has observed smoke in excess of allowable limits and that he is in violation of Henderson County APCD Rule 50. He then asks to see the incinerator. Mr. Peterson replies, "I didn't know we are in any kind of violation. I don't see how that could be -- we have the necessary permit to operate. As I understand it, that's supposed to be a smokeless incinerator."

As they walk through the plant to the rear, the first floor is comparatively empty except for some apparently new equipment in the rear of the plant. There appear to be a degreasing unit and five tanks (two of which have buss bars, drains, etc., suitable for plating use). The inspector also notices that part of the cement flooring is broken up as if to make way for new plumbing, and that unassembled ventilation system parts, including hooding, a blower motor and fan, are located near the tanks.

The inspector asks Mr. Peterson what business the company is engaged in. Mr. Peterson replies, "Hard chrome plating --we're the Hartley Division, Compton Metals Company." In further conversation, the inspector learns that the company moved to this location just three months ago.

They arrive at the incinerator at 9:09 A.M. No visible emissions are observed. Mr. Peterson exclaims, "See, it's not smoking!" The inspector explains that he observed a violation before he entered the plant, and asks who lit the incinerator. Peterson replies, "I did. Mr. Allan, the Plant Manager, asked that I clean out the debris left from the previous tenant. I've been doing this sort of thing since we are still short of custodial help." On further questioning, Mr. Peterson disclosed that he had charged two 50-gallon drums of paint cans, styrofoam packing materials, creosoted wood timbers, rubber and plastic materials, cardboard and paper wastes, and rubber and plastic gasket materials in the incinerator.

Hubbard inspects the interior of the incinerator and observes evidence of paint cans and rubber and plastic residue. The interior appears to be in good condition. He notes a slightly smouldering burning pile, 2 ft. in diameter x 1 ft. high. The inspector also observes the following:

- A permit posted on the side of the incinerator made out to "Johnson Storage Co.", 5678 S. Main St., Henderson, Ohio, Permit No. P-5934, dated Sept. 15, 1977 authorizes the operation of one (1) ACME Multiple-Chamber retort type incinerator rated at 75 lbs./hour, equipped with 1-Larkin manual secondary gas burner rated at 150×10^3 Btu/hour. Incinerator to be used for Type 0" waste only. Secondary burner must be in operation through all burning periods.
- Secondary burner not in operation.
- All air port doors were closed.
- Refractories and stack appear to be in good condition.
- Two sampling ports are noted in the stack.

The case study ends here, but not necessarily the inspection. At this point begin the exercise for Lesson 5.

EXERCISE FOR LESSON 5

1. List at least five (5) important errors pertaining to different principles of good on-site inspection and investigative practice.

2. List the number of potential violations and specify the Rule which has been violated.

3. Complete the Notice of Visible Emission Violation form, both front and back. Again make assumptions and circle or underline where assumptions were necessary to complete the notice and report.

4. If so instructed, each Team is to turn in one answer sheet with the completed Observation Form and Notice of Violation Form, signed by all members of the Team.

STUDENT EXERCISE NO. 1

SECTION II

LESSON 5

ANSWER SHEET

TEAM_________________________

MEMBERS SIGN

____

____

____

____

1. List at least five important errors pertaining to different principles of good on-site inspection and investigative practice.

   1. ____
   2. ____
   3. ____
   4. ____
   5. ____
   6. ____

STUDENT EXERCISE NO. 1

LESSON 5

ANSWER SHEET (CONT'D)

2. List the number of potential violations and specify the Rule which has been violated.

Rule	No. of Violations	Description

3. Complete the notice of Violation Form, front and back.

4. If so instructed, each Team is to turn in one completed Answer Sheet, signed by all members of the Team and one completed Notice of Violation Form, front and back.

OPERATOR
Name & Address

HIS REMARKS

WAS MANAGEMENT CONTACTED YES NO

NAME TITLE

HIS REMARKS

FINDINGS (INCLUDING INSPECTOR'S FULL EXPLANATION OF VIOLATION)

CORPORATE OFFICER

DRIVER'S LICENSE NO.

VACATION FROM TO

REQUEST FOR COMPLAINT SIGNED DATE

BACK 1-14

CLASSIFICATION OF WASTES TO BE INCINERATED

Classification of Wastes		Principal Components	Approximate Composition % by Weight
Type	Description		
*0	Trash	Highly combustible waste, paper, wood, carboard cartons, including up to 10% treated papers, plastic or rubber scraps; commercial and industrial sources	Trash 100%
*1	Rubbish	Combustible waste, paper, cartons, rags, wood scraps, combustible floor sweepings; domestic, commercial, and industrial sources	Rubbish 80% Garbage 20%
*2	Refuse	Rubbish and garbage; residential sources	Rubbish 50% Garbage 50%
*3	Garbage	Animal and vegetable wastes, restaurants, hotels, markets; institutional, commercial, and club sources	Garbage 65% Rubbish 35%
4	Animal solids and organic wastes	Carcasses, organs, solid organic wastes; hospital, laboratory, abattoirs, animal pounds, and similar sources	100% Animal and Human Tissue
5	Gaseous, liquid or semi-liquid wastes	Industrial process wastes	Variable
6	Semi-solid and solid wastes	Combustibles requiring hearth, retort, or grate burning equipment	Variable

RELATIONSHIP BETWEEN R AND OPACITY

"R" NO.	% OPACITY
0	0
1	20
2	40
3	60
4	80
5	100

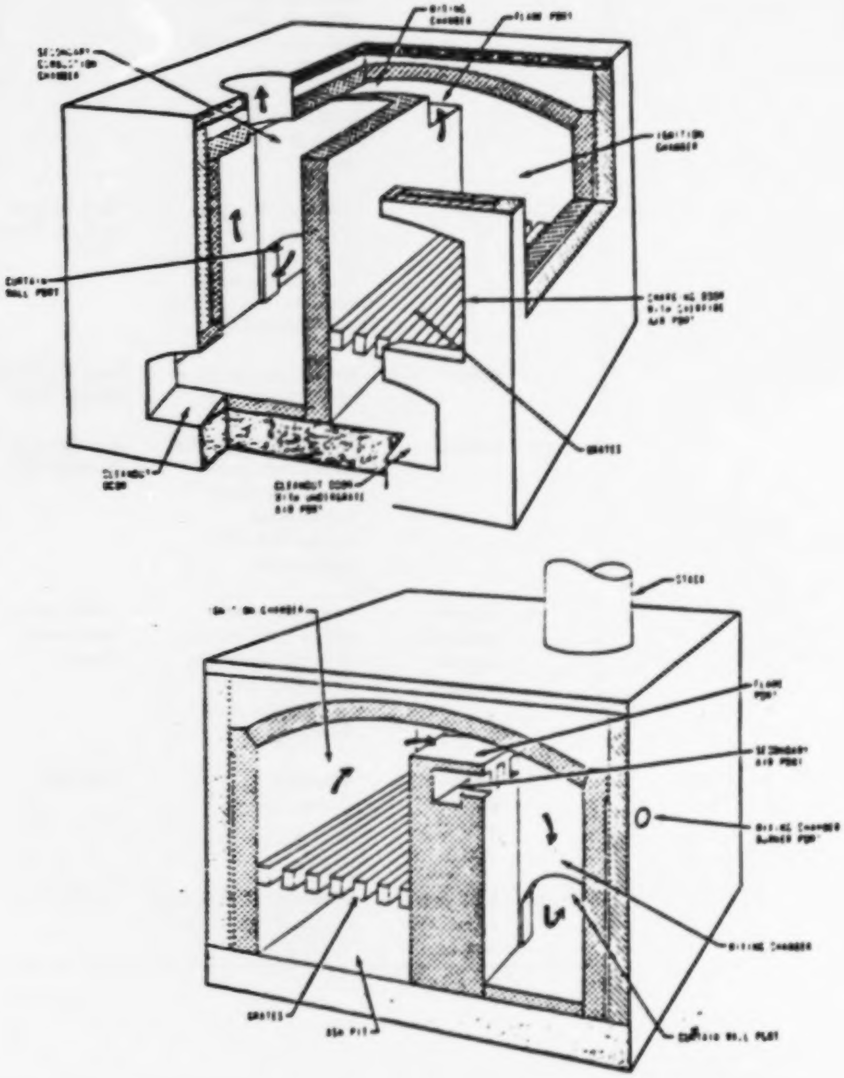

MIXING CHAMBER
FLAME PORT
SECONDARY COMBUSTION CHAMBER
IGNITION CHAMBER
CURTAIN WALL PORT
CHARGING DOOR WITH OVERFIRE AIR PORT
GRATES
CLEANOUT DOOR
CLEANOUT DOOR WITH UNDERGRATE AIR PORT
STACK
IGNITION CHAMBER
FLAME PORT
SECONDARY AIR PORT
MIXING CHAMBER BURNER PORT
MIXING CHAMBER
GRATES
ASH PIT
CURTAIN WALL PORT

Figure 6.3.1. CUTAWAY OF A RETORT MULTIPLE-CHAMBER INCINERATOR (SOURCE: AIR POLLUTION ENGINEERING MANUAL, Reference 4)

SPECIMENS OF RULES AND REGULATIONS

HENDERSON COUNTY AIR POLLUTION CONTROL DISTRICT

REGULATION II PERMITS

Rule 1. DECLARATION OF POLICY AND THE PURPOSE

It is hereby declared to be the public policy of this Henderson County Air Pollution Control District and the purpose of this regulation to achieve and maintain such levels of air quality as will protect human health, life, and safety or comfort.

Rule 2. DEFINITION OF TERMS

(a) Air Contaminant. Any smoke, soot, fly ash, dust, cinders, cinders, dirt, fumes, gases, vapors, mists, liquid, particulate or odorous matter, not including uncombined water vapors.

(b) Air Pollution. The presence in the ambient air of one or more air contaminants or any combination thereof in such quantity and of such characteristics and duration as to injure or tend to injure human health or welfare, plant or animal life, or property, or which would interfere with the enjoyment of life or use of property.

(c) Effective Date of Regulation. This date shall be July 1, 1975, notwithstanding any amendment, rescission, or renumbering of of any of these regulations.

(d) Emission. Act of releasing or discharging any air pollutant into the ambient air from any source.

(e) Opacity. A state which renders material partially or wholly impervious to rays of light and causes obstruction of an observer's view.

(f) Person. Any individual, firm, public or private corporation, association, business, trust, company, partnership, contractor, supplier, installer, user, operator, or owner, or any political subdivision or employee thereof, or any other entity.

(g) Ringelmann Chart. The chart published and described in the United States Bureau of Mines Information Circular 8333 (May, 1967).

(h) Source. Any operation, or real or personal property, or person which emits or may emit any air pollutant.

* * * * *

Rule 10. PERMITS REQUIRED

(a) Authority to Construct. Any person building, erecting, altering or replacing any article, machine, equipment or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate or reduce or control the issuance of air contaminants, shall first obtain authorization for such construction from the Air Pollution Control Officer. An Authority to Construct shall remain in effect until the permit to operate the equipment for which the application was filed is granted or denied or the application is canceled.

(b) Permit to Operate. Before any article, machine, equipment or other contrivance described in Rule 10(a) may be operated or used, a written permit shall be obtained from the Air Pollution Control Officer. No permit to operate or use shall be granted either by the Air Pollution Control Officer or the Hearing Board for any article, machine, equipment or contrivance described in Rule 10(a), constructed or installed without authorization as required by Rule 10(a), until the information required is presented to the Air Pollution Control Officer and such article, machine, equipment or contrivance is altered, if necessary, and made to conform to the standards set forth in Rule 20 and elsewhere in these Rules and Regulations.

(c) Posting of Permit to Operate. A person who has been granted under Rule 10 a permit to operate any article, machine, equipment, or other contrivance described in Rule 10(b), shall firmly affix such permit to operate, an approved facsimile, or other approved identification bearing the permit number upon the article, machine, equipment, or other contrivance in such a manner as to be clearly visible and accessible. In the event that the article, machine, equipment, or other contrivance is so constructed or operated that the permit to operate cannot be so placed, the permit to operate shall be mounted so as to be clearly visible in an accessible place within 25 feet of the article, machine, equipment, or other contrivance, or maintained readily available at all times on the operating premises.

(d) A person shall not wilfully deface, alter, forge, counterfeit, or falsify a permit to operate any article, machine, equipment, or other contrivance.

* * * * *

Rule 12. TRANSFER

An authority to construct, permit to operate or permit to sell or rent shall not be transferable, whether by operation of law or otherwise, either from one location to another, from one piece of equipment to another, or from one person or corporation to another.

* * * * *

Rule 19. PROVISION OF SAMPLING AND TESTING FACILITIES

A person operating or using any article, machine, equipment or other contrivance for which these rules require a permit shall provide and maintain such sampling and testing facilities as specified in the authority to construct or permit to operate.

REGULATION IV. PROHIBITIONS

Rule 50. CONTROL OF VISIBLE AIR CONTAMINANTS FROM STATIONARY SOURCES

(a) Emission Limitations

1. No person shall discharge into the atmosphere from any single stationary source of emission whatsoever, any air contaminant of a shade or density equal to or darker than that designated as No. 1 on the Ringelmann Chart or 20 percent opacity, except as set forth in subsection (a) (2) and section (b) of Rule 50.

2. A person may discharge into the atmosphere from any single stationary source of emission for a period or periods aggregating not more than three (3) minutes in any sixty (60) minutes, air contaminants of a shade or density not darker than No. 3 on the Ringelmann Chart or 60 percent opacity.

(b) Uncombined Water

It shall be deemed not to be a violation of Rule 50 (a), where the presence of uncombined water is the only reason for failure of an emission to meet the requirements of Rule 50 (a).

Rule 51. NUISANCE

A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.

Rule 52. PARTICULATE MATTER.

Except as otherwise provided in Rules 53 and 54, a person shall not discharge into the atmosphere from any source particulate matter in excess of 0.2 grain per cubic foot of gas at standard conditions.

Rule 53. SPECIFIC CONTAMINANTS.

A person shall not discharge into the atmosphere from any single source of emission whatsoever any one or more of the following contaminants, in any state or combination thereof, exceeding in concentration at the point of discharge:

(a) Sulphur Compounds calculated as sulphur dioxide (SO_2): 0.1 per cent, by volume.

(b) Combustion Contaminants: 0.2 grain per cubic foot of gas calculated to 12 per cent of carbon dioxide (CO_2) at standard conditions. In measuring the combustion contaminants from incinerators used to dispose of combustible refuse by burning, the carbon dioxide (CO_2) produced by combustion of any liquid or gaseous fuels shall be excluded from the calculation to 12 per cent of carbon dioxide (CO_2).

Rule 54. DUST AND FUMES

A person shall not discharge in any one hour from any source whatsoever dust or fumes in total quantities in excess of the amount shown in the following table: (see next page)

To use the following table, take the process weight per hour as such is defined in Rule 2(j). Then find this figure on the table, opposite which is the maximum number of pounds of contaminants which may be discharged into the atmosphere in any one hour. As an

TABLE FOR RULE 54

(Amended January 6, 1972)

Process Weight Per Hour–Pounds Per Hour	Maximum Discharge Rate Allowed for Solid Particulate Matter (Aggregate Discharged From All Points of Process)–Pounds Per Hour	Process Weight Per Hour–Pounds Per Hour	Maximum Discharge Rate Allowed for Solid Particulate Matter (Aggregate Discharged From All Points of Process)–Pounds Per Hour
250 or less	1.00	12000	10.4
300	1.12	14000	10.8
350	1.23	16000	11.2
400	1.34	18000	11.5
450	1.44	20000	11.8
500	1.54	25000	12.4
600	1.73	30000	13.0
700	1.90	35000	13.5
800	2.07	40000	13.9
900	2.22	45000	14.3
1000	2.38	50000	14.7
1200	2.66	60000	15.3
1400	2.93	70000	15.9
1600	3.19	80000	16.4
1800	3.43	90000	16.9
2000	3.66	100000	17.3
2500	4.21	120000	18.1
3000	4.72	140000	18.8
3500	5.19	160000	19.4
4000	5.64	180000	19.9
4500	6.07	200000	20.4
5000	6.49	250000	21.6
5500	6.89	300000	22.5
6000	7.27	350000	23.4
6500	7.64	400000	24.1
7000	8.00	450000	24.8
7500	8.36	500000	25.4
8000	8.70	600000	26.6
8500	9.04	700000	27.6
9000	9.36	800000	28.4
9500	9.68	900000	29.3
10000	10.00	1000000 or more	30.0

example, if A has a process which emits contaminants into the atmosphere and which process takes 3 hours to complete, he will divide the weight of all materials in the specific process, in this example, 1,500 lbs. by 3 giving a process weight per hour of 500 lbs. The table shows that A may not discharge more than 1.77 lbs. in any one hour during the process. Where the process weight per hour falls between figures in the left hand column, the exact weight of permitted discharge may be interpolated.

Rule 57. OPEN FIRES

A person shall not burn any combustible refuse in any open outdoor fire within Henderson County, except:

(a) When such fire is set or permission for such fire is given in the performance of the official duty of any public officer, and such fire in the opinion of such officer is necessary:

1. For the purpose of the prevention of a fire hazard which cannot be abated by any other means, or

2. The instruction of public employees in the methods of fighting fire.

(b) When such fire is set pursuant to permit on property used for industrial purposes for the purpose of instruction of employees in methods of fighting fire.

(c) When such fire is set in the course of any agricultural operation in the growing of crops, or raising of fowls or animals.

These exceptions shall not be effective any any calendar day on which the Air Pollution Control Officer determines that:

1. The inversion base at 4:00 A.M., Eastern Standard Time, will be lower than 1,500 ft. above mean sea level, and

2. The maximum mixing height will not be above 3,500, and

3. The average surface wind speed between 6:00 A.M. and 12:00 noon, Eastern Standard Time, will not exceed five miles per hour.

Rule 58. INCINERATOR BURNING

A person shall not burn any combustible refuse in any incinerator within the Henderson County, except in a multiple-chamber incinerator as described in Rule 2(p), or in equipment found by the Air Pollution Control Officer in advance or such use to be equally effective for the purpose of air pollution control as an approved multiple-chamber incinerator.

Rule 60. CIRCUMVENTION

A person shall not build, erect, install, or use any article, machine, equipment or other contrivance, the use of which, without resulting in a reduction in the total release of air contaminants to the atmosphere, reduces or conceals an emission which would otherwise constitute a violation of Division 20, Chapter 2 of the Health and Safety Code or of these Rules and Regulations. This Rule shall not apply to cases in which the only violation involved is of the Health and Safety Code, or of Rule 51 of these Rules and Regulations.

STUDENT EXERCISE NO. 2

INSPECTION OF A CEMENT PLANT

INSPECTION OF A CEMENT PLANT

(FILM)

GOAL. To demonstrate off-site and on-site inspection procedures by depicting on film a permit status inspection of a cement plant. The student's proficiency is tested by completing inspection report forms to record conditions shown in the film.

OBJECTIVES. At the end of this exercise, the student should be able to:

1. List the elements included in a facility inspection.
2. Describe the basic process of manufacturing Portland cement (dry process).
3. Use existing agency data to prepare for an inspection.
4. Properly obtain entry to a facility for the purpose of conducting an inspection.
5. Interface effectively with plant management and personnel so as to elicit their help and cooperation.
6. List inspection points for cement plants.
7. Examine the appropriate inspection points for permit compliance.

SELECTED READING: Inspection Manual for Enforcement of New Source Performance Standards. Portland Cement Plants. Reference 7.1

INSTRUCTIONS FOR EXERCISE NO. 2

This unit centers around a film showing an FEO conducting a routine inspection of a dry type cement plant. The student observes the movement of the FEO and the results of his inspection. After the film is shown, the student is required to complete his own inspection findings using the data gathering form starting on page 2-4. When all students are finished, your completed findings will be compared to those of the instructors, and the session ends with a discussion of the lesson and student work.

NOTE: Most of the data you need to complete the form can be determined from viewing the film, but some information you may need can be found in this section.

SUGGESTED INSPECTION POINTS AND DATA GATHERING QUESTIONS

CEMENT PLANT KILN AND CLINKER COOLER*

The plant perimeter

Control room instrument readings* (Points 1A, 1B, & 1C on flow diagram)

Delivery end of Kiln (Point 2B)

Clinker cooler enclosure (Point 3A)

Dust return spout and conveyor (Point 4B)

Clinker cooler baghouse (Point 4)

---

*Refer to the drawings at the end of this form, for a plant flow diagram indicating inspection points and for actual control room instrument readings.

Bag cleaning compressor (Point 4)

Clinker cooler baghouse fan and motor (Point 4)

Clinker cooler baghouse stack (Point 4)

Multi-cyclone pre-heater (Shown in film - not shown on film diagram)

Kiln baghouse enclosure and stack (Point 5)

Area below kiln baghouse (Point 5A)

Kiln baghouse manometers*

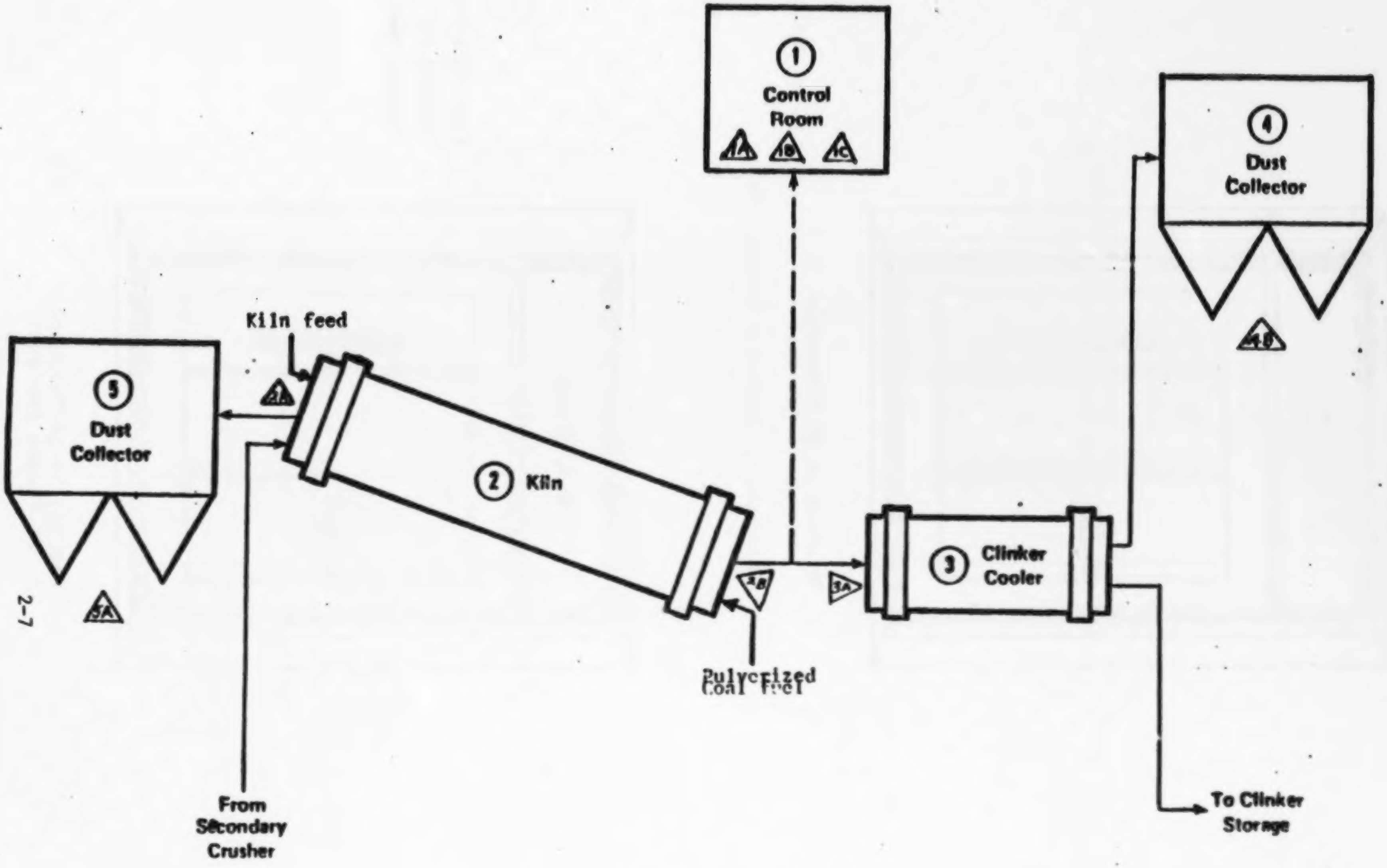
*Refer to the drawings at the end of this form.

Kiln baghouse hoppers and screw conveyor (Point 5A)

Kiln baghouse dust return system (Point 5A)

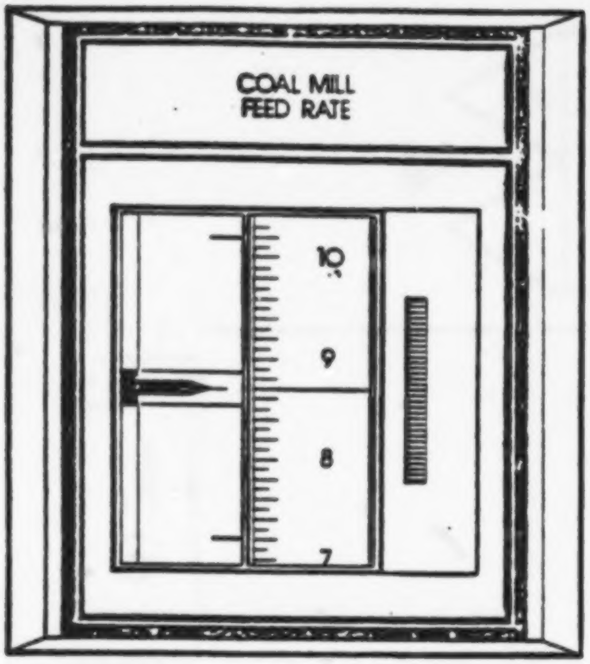
Kiln baghouse fan and motor (Point 5)

Plant Yard


1
Control Room
1A
1B
1C
4
Dust Collector
4B
Kiln feed
5
Dust Collector
5A
2A
2 Kiln
3B
3A
3 Clinker Cooler
Pulverized Coal Feed
From Secondary Crusher
To Clinker Storage

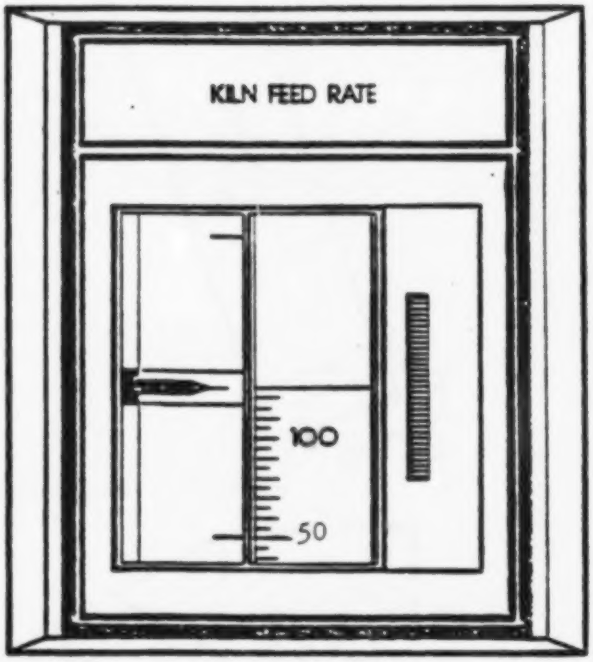
Cement Plant Inspection Sequence

△ indicates inspection points


COAL MILL
FEED RATE
10
9
8
7

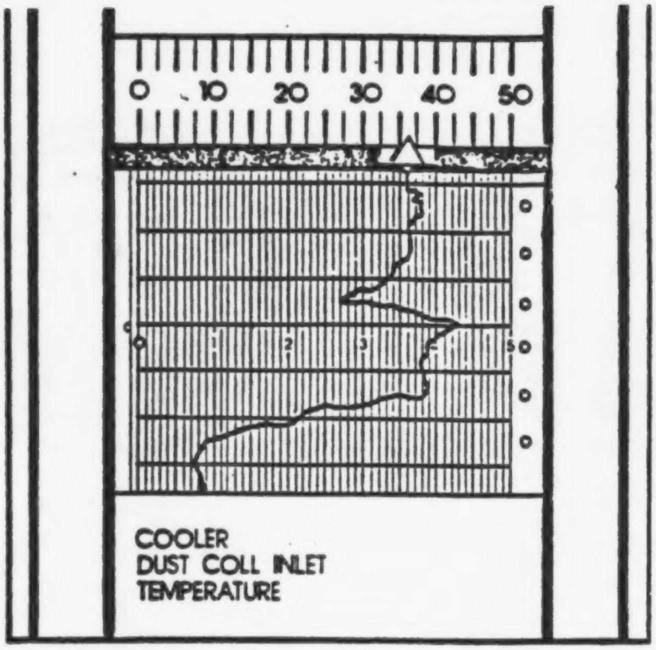
Reading is in Thousands
of Pounds Per Hour

(This recorder located in Control Room)


KILN FEED RATE
100
50

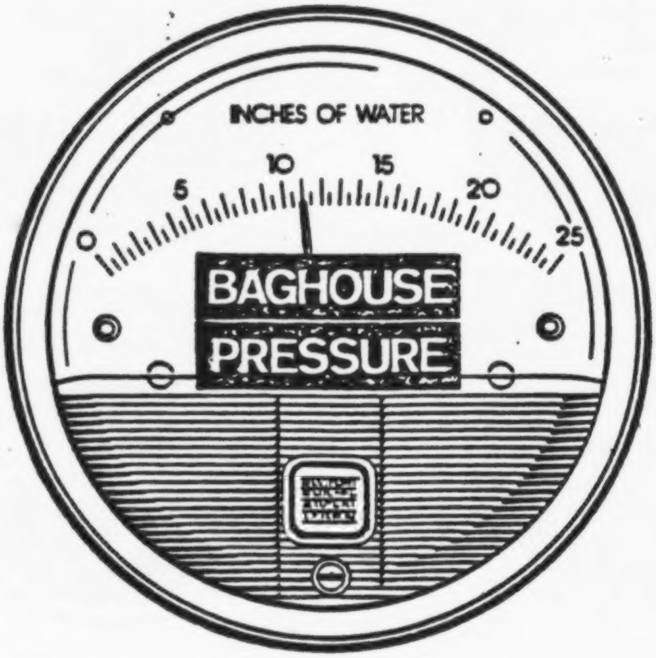
(This recorder
located in
Control Room)

Reading is in Thousands
of Pounds Per Hour


0
10
20
30
40
50
COOLER
DUST COLL INLET
TEMPERATURE

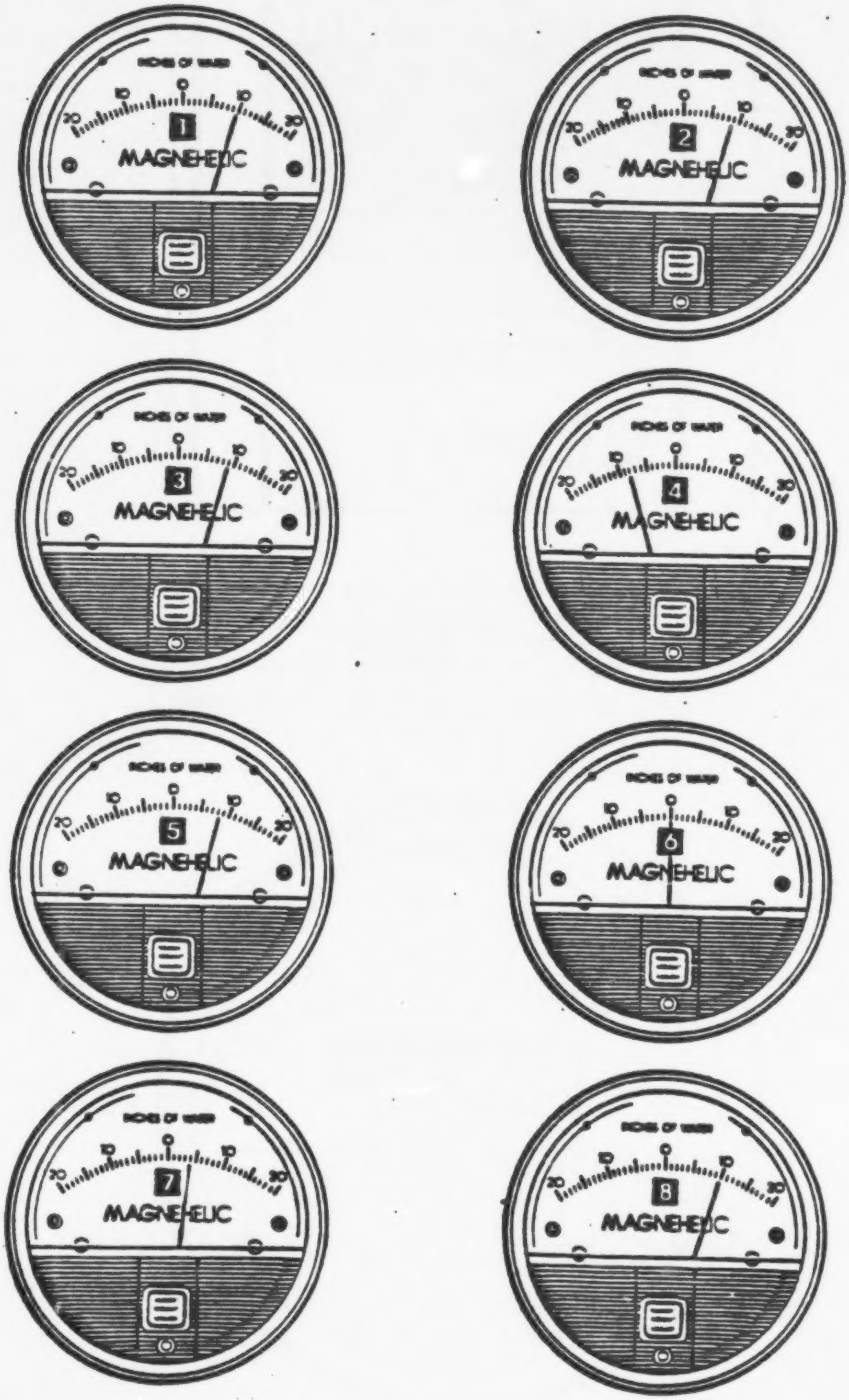
Clinker Cooler Gas
Inlet Temperature
in Degrees Farenheit
(Temp. = chart number x 10)

(Recorder located in Control Room)


INCHES OF WATER
0
5
10
15
20
25
BAGHOUSE
PRESSURE

Kiln Baghouse System Pressure

(Overall baghouse pressure)


INCHES OF WATER
20
10
0
10
20
MAGNEHELIC
1
2
3
4
5
6
7
8

Kiln Baghouse Cell Readings

- Cement Plant File Information
    - Permit Application
    - Kiln Data
    - Kiln Baghouse Data
    - Clinker Cooler Data
    - Clinker Cooler Baghouse Data
    - Summary of Source Operation - Kiln
    - Summary of Pitot Traverse Data - Kiln
    - Summary of Particulate Sampling Data - Kiln
    - Summary of Source Operation - Clinker Cooler
    - Summary of Pitot Traverse Data - Clinker Cooler
    - Summary of Particulate Sampling Data - Clinker Cooler

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

APPLICATION FOR A PERMIT(A)
☐ CONSTRUCT ☒ OPERATE

NAME OF EQUIPMENT TO BE CONSTRUCTED OR OPERATED: Cement Plant (B)

FOR AGENCY USE ONLY
I. D. NO. ____
PERMIT NO. ____
DATE ____

1a. NAME OF OWNER: Ajax Cement Corporation
1b. STREET ADDRESS OF OWNER: 100 Park AVenue
1c. CITY OF OWNER: New York
1d. STATE OF OWNER: New York
1e. ZIP CODE: 10101

2a. NAME OF OPERATOR: Ajax Cement Corporation
2b. STREET ADDRESS OF OPERATOR: 123 River Street
2c. CITY OF OPERATOR: Clearview
2d. STATE OF OPERATOR: Illinois
2e. ZIP CODE: 60000

3a. NAME OF CORPORATE DIVISION OR PLANT: Riverview Plant
3b. STREET ADDRESS OF EMISSION SOURCE: 123 River Street
3c. CITY OF EMISSION SOURCE: Clearview
3d. LOCATED WITHIN CITY LIMITS: ☒ YES ☐ NO
3e. TOWNSHIP: Smith
3f. COUNTY: Jones
3g. ZIP CODE: 60000

4. ALL CORRESPONDENCE TO: (NAME OF INDIVIDUAL) Donald Carson
5. TELEPHONE NUMBER FOR AGENCY TO CALL: 800/555-4567
6. ADDRESS FOR CORRESPONDENCE: (CHECK ONLY ONE) ☐ OWNER: ☒ OPERATOR ☐ EMISSION SOURCE
7. YOUR ID NUMBER FOR THIS APPLICATION:(C) RP2973

8. THE UNDERSIGNED HEREBY MAKES APPLICATION FOR A PERMIT AND CERTIFIES THAT THE STATEMENTS CONTAINED HEREIN ARE TRUE AND CORRECT, AND FURTHER CERTIFIES THAT ALL PREVIOUSLY SUBMITTED INFORMATION REFERENCED IN THIS APPLICATION REMAINS TRUE, CORRECT AND CURRENT. BY AFFIXING HIS SIGNATURE HERETO HE FURTHER CERTIFIES THAT HE IS AUTHORIZED TO EXECUTE THIS APPLICATION.

AUTHORIZED SIGNATURE(S):(D)

BY Donald Carson SIGNATURE 2/9/73 DATE
Donald Carson TYPED OR PRINTED NAME OF SIGNER
____ TITLE OF SIGNER

BY ____ SIGNATURE ____ DATE
____ TYPED OR PRINTED NAME OF SIGNER
____ TITLE OF SIGNER

(A) THIS FORM IS TO PROVIDE THE AGENCY WITH GENERAL INFORMATION ABOUT THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS FORM MAY ONLY BE USED TO REQUEST ONE TYPE OF PERMIT - CONSTRUCTION OR OPERATION - AND NOT BOTH.

(B) CLEARLY IDENTIFY THE GENERIC NAME OF THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. SUCH IDENTIFICATION WILL APPEAR ON THE PERMIT WHICH MAY BE ISSUED PURSUANT TO THIS APPLICATION. THIS FORM MUST BE ACCOMPANIED BY THE APPLICABLE ADDENDA.

(C) PROVIDE A NUMBER IN ITEM 7 ABOVE WHICH YOU WOULD LIKE THE AGENCY TO USE FOR IDENTIFICATION OF YOUR EQUIPMENT. YOUR IDENTIFICATION NUMBER WILL BE REFERENCED IN ALL CORRESPONDENCE, RELATIVE TO THIS APPLICATION, FROM THIS AGENCY. YOUR IDENTIFICATION NUMBER MUST NOT EXCEED TEN (10) CHARACTERS.

(D) THIS APPLICATION MUST BE SIGNED IN ACCORDANCE WITH PCB REGS., CHAPTER 2, PART 1, RULE 103(a)(4) OR 103(b)(5) WHICH STATES: "ALL APPLICATIONS AND SUPPLEMENTS THERETO SHALL BE SIGNED BY THE OWNER AND OPERATOR OF THE EMISSION SOURCE OR AIR POLLUTION CONTROL EQUIPMENT, OR THEIR AUTHORIZED AGENT, AND SHALL BE ACCOMPANIED BY EVIDENCE OF AUTHORITY TO SIGN THE APPLICATION."

IF THE OWNER OR OPERATOR IS A CORPORATION, SUCH CORPORATION MUST HAVE ON FILE WITH THE AGENCY A CERTIFIED COPY OF A RESOLUTION OF THE CORPORATION'S BOARD OF DIRECTORS AUTHORIZING THE PERSONS SIGNING THIS APPLICATION TO CAUSE OR ALLOW THE CONSTRUCTION OR OPERATION OF THE EQUIPMENT TO BE COVERED BY THE PERMIT.

9. AN OPERATING PERMIT APPLICATION MUST BE SUBMITTED IN DUPLICATE.
A CONSTRUCTION PERMIT APPLICATION FOR CONSTRUCTION IN COOK COUNTY OUTSIDE OF THE CORPORATE LIMITS OF CHICAGO MUST BE SUBMITTED IN QUADRUPLICATE.
A CONSTRUCTION PERMIT APPLICATION IN ALL OTHER LOCATIONS MUST BE SUBMITTED IN TRIPLICATE.

10. THE APPLICANT SHALL SUBMIT A PLOT PLAN AND MAP SHOWING DISTANCES TO THE NEAREST BOUNDARY OF THE PROPERTY ON WHICH THE OPERATION IS LOCATED AND DISTANCES TO THE NEAREST RESIDENCES, LODGINGS, NURSING HOMES, HOSPITALS, SCHOOLS AND COMMERCIAL AND MANUFACTURING ESTABLISHMENTS. IF SUCH A PLOT PLAN AND MAP HAS ALREADY BEEN SUBMITTED, INDICATE THE ASSOCIATED AGENCY I.D. NUMBER AND PERMIT APPLICATION NUMBER. AGENCY I.D. NO. ___ ___ ___ APPLICATION NO. _ ___ ____

11. THE APPLICANT SHALL SUBMIT A PROCESS FLOW DIAGRAM DEPICTING ALL EMISSION SOURCES AND ALL AIR POLLUTION CONTROL EQUIPMENT COVERE. BY THIS PERMIT APPLICATION. THE DIAGRAM SHALL INCLUDE LABELS FOR EACH EMISSION SOURCE AND EACH ITEM OF AIR POLLUTION CONTROL EQUIPMENT, AND SHALL SET FORTH MAXIMUM FLOW RATES FOR (1) ALL PROCESSING EQUIPMENT, (2) ALL AIR POLLUTION CONTROL EQUIPMENT, (3) ALL EMISSION SOURCES, AND (4) ALL STACKS AND VENTS. NUMBER OF SHEETS: 2 DRAWING NUMBER(S): 1 & 2

12. FOR EACH EMISSION SOURCE AND EACH ITEM OF AIR POLLUTION CONTROL EQUIPMENT IDENTIFIED ON THE PROCESS FLOW DIAGRAM, THE APPLICANT SHALL COMPLETE AND SUBMIT THE APPLICABLE PERMIT APPLICATION FORMS. THE FLOW DIAGRAM SHALL INDICATE THROUGH WHICH STACK OR VENT AN EMISSION SOURCE OR ITS RELATED AIR POLLUTION CONTROL EQUIPMENT IS EXHAUSTED. IF IT IS EXHAUSTED WITHIN A BUILDING, SO INDICATE.

13. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE APPLICANT IS INCORPORATING BY REFERENCE PREVIOUSLY GRANTED INSTALLATION OR CONSTRUCTION PERMITS, HE SHALL COMPLETE FORM APC-210, ENTITLED "DATA AND INFORMATION -- INCORPORATION BY REFERENCE."

14. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE STARTUP OF ANY EMISSION SOURCE DESCRIBED BY THIS APPLICATION PRODUCES AN AIR CONTAMINANT IN EXCESS OF APPLICABLE STANDARDS, THE APPLICANT MAY REQUEST PERMISSION TO EXCEED SUCH STANDARDS BY COMPLETING FORM APC-203, ENTITLED "OPERATION DURING STARTUP."

15. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE APPLICANT IS APPLYING FOR PERMISSION TO OPERATE AN EMISSION SOURCE DURING MALFUNCTIONS OR BREAKDOWNS PURSUANT TO PCB REGS., CHAPTER 2, RULE 105, THE APPLICANT MAY REQUEST SUCH PERMISSION BY COMPLETING FORM APC-204, ENTITLED "OPERATION DURING MALFUNCTION AND BREAKDOWN."

16. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT AND ALL OR ANY PART OF THE PROCESS MUST BE CONTROLLED OR MODIFIED TO COMPLY WITH APPLICABLE REGULATIONS, THE APPLICANT SHALL COMPLETE FORM APC-202, ENTITLED "COMPLIANCE PROGRAM & PROJECT COMPLETION SCHEDULE."

17. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, DOES THE OPERATION COVERED BY THIS APPLICATION REQUIRE AN EPISODE ACTION PLAN? ☒ YES ☐ NO

18. WAS EACH EMISSION SOURCE COVERED BY THIS APPLICATION, AS OF APRIL 14, 1972, IN COMPLIANCE WITH THE "RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION," ADOPTED BY THE FORMER AIR POLLUTION CONTROL BOARD AND CONTINUED EFFECTIVE PURSUANT TO SECTION 49(c) OF THE ENVIRONMENTAL PROTECTION ACT? ☒ YES ☐ NO

19. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, WAS THE OPERATION THE SUBJECT OF A VARIANCE PETITION FILED WITH THE ILLINOIS POLLUTION CONTROL BOARD ON OR BEFORE JUNE 13, 1972? ☒ YES ☐ NO

IF "YES," CITE PCB NUMBER(S): ____________ DATE OF BOARD ORDER: ____________

HAD THE APPLICANT ON OR BEFORE APRIL 14, 1972, COMMENCED CONSTRUCTION OF EQUIPMENT OR MODIFICATIONS SUFFICIENT TO ACHIEVE COMPLIANC WITH THE APPLICABLE LIMITATIONS OF THE "RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION," ADOPTED BY THE FORMER AIR POLLUTION CONTROL BOARD AND CONTINUED EFFECTIVE PURSUANT TO SECTION 49(c) OF THE ENVIRONMENTAL PROTECTION ACT? ☒ YES ☐ NO

IF "NO," EXPLAIN IN DETAIL AND MARK YOUR EXPLANATION AS EXHIBIT D.

TOTAL NUMBER OF PAGES IN EXHIBIT D: ____________

20. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, THE APPLICANT SHALL SUBMIT AN ESTIMATE OF THE MAXIMUM ONE-HOUR AMOUNTS OF PARTICULATE MATTER, SULFUR DIOXIDE, CARBON MONOXIDE, OXIDES OF NITROGEN, AND ORGANIC MATERIAL EMITTED FROM ALL SOURCES LOCATED ON THE PLANT OR PREMISES. THIS ESTIMATE SHALL INCLUDE ALL EMISSION SOURCES LOCATED ON THE APPLICANT'S PREMISES AND NOT JUST THE EMISSION SOURCES DESCRIBED IN THIS APPLICATION.

MATERIAL	MAXIMUM ONE-HOUR AMOUNTS	MATERIAL	MAXIMUM ONE-HOUR AMOUNTS	MATERIAL	MAXIMUM ONE-HO AMOUNTS
PARTICULATE MATTER	30 LB	SULFUR DIOXIDE	450 LB	NITROGEN OXIDES	270
ORGANIC MATERIAL	4.6 LB	CARBON MONOXIDE	15 LB		

21. WHAT IS THE SIZE (IN ACRES) OF APPLICANT'S PREMISES? 500

22. LIST AND IDENTIFY ALL FORMS, EXHIBITS, AND OTHER INFORMATION SUBMITTED AS PART OF THIS APPLICATION. PLEASE NUMBER EVERY PAGE AND STATE THE TOTAL NUMBER OF PAGES IN THIS APPLICATION.

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION PROCESS EMISSION SOURCE(A) Cement Kiln	FOR AGENCY USE ONLY

1. NAME OF PLANT OWNER: Ajax Cement Corporation	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OW
3. STREET ADDRESS OF EMISSION SOURCE: 123 River Street	4. CITY OF EMISSION SOURCE: Clearview

GENERAL INFORMATION

5. NAME OF PROCESS: Portland Cement Mfg.	6. NAME OF EMISSION SOURCE EQUIPMENT: Rotary Kiln	
7. EMISSION SOURCE EQUIPMENT MANUFACTURER: Fuller/Gatx	8. MODEL NUMBER: PT-50	9. SERIAL NUMBER: F.G.1329

10. FLOW DIAGRAM DESIGNATIONS OF EMISSION SOURCES DESCRIBED ON THIS FORM (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

11. CLEARLY IDENTIFY ANY SIMILAR SOURCES AT THE PLANT OR PREMISES NOT COVERED BY THIS FORM (IF SUCH SOURCES ARE COVERED BY FORMS CONT IN OTHER APPLICATIONS, ALSO IDENTIFY THOSE APPLICATIONS):

12. AVERAGE OPERATION TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 52 WKS/YR	13. PERCENT OF ANNUAL THROUGHPUT: DEC/FEB 25 % MAR/MAY 25 % JUN/AUG 25 % SEP/NOV 25

RAW MATERIAL INFORMATION

14. NAMES OF RAW MATERIALS(B)	MAXIMUM RATE PER IDENTICAL SOURCE		AVERAGE RATE PER IDENTICAL SOURCE
a. Limestone	66,300	LB/HR	66,300
b. Cement Rock	20,000	LB/HR	20,000
c. Clay	3,000	LB/HR	3,000
d. Iron Ore	10,000	LB/HR	10,000
e.		LB/HR	
f. Coal	15,000	LB/HR	15,000

(A) THIS DATA AND INFORMATION FORM IS TO BE COMPLETED FOR ANY STATIONARY EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS ANY FURNACE, BOILER, OR SIMILAR EQUIPMENT USED FOR THE PRIMARY PURPOSE OF P DUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. FOR SUCH AN EMISSION SOURCE, COMPLETE "DATA AND INFORMATION --FUEL COMBUSTION EM SOURCE," FORM APC-240. AN INCINERATOR IS A COMBUSTION APPARATUS IN WHICH REFUSE IS BURNED. FOR SUCH AN EMISSION SOURCE, COMPLET "DATA AND INFORMATION — INCINERATOR," FORM APC-250.

(B) COMPOSITIONS OF RAW MATERIALS MUST BE DETAILED TO THE EXTENT NECESSARY TO DETERMINE THE NATURE AND QUANTITY OF POTENTIAL EMISSION

FOR AGENCY USE ONLY

PRODUCT INFORMATION

15. NAMES OF PRODUCTS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Portland Cement Clinker	106,000 LB/HR	91,250
b.	LB/HR	
c.	LB/HR	
d.	LB/HR	

WASTE MATERIAL INFORMATION

16. NAMES OF WASTE MATERIALS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. None - All returned to system	LB/HR	
b.	LB/HR	
c.	LB/HR	
d.	LB/HR	

MAXIMUM EMISSIONS FROM EACH IDENTICAL SOURCE*

CONTAMINANT	CONCENTRATION OR EMISSION RATE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
17. PARTICULATE MATTER	a. GR/SCF	b. LB/HR	c.
18. CARBON MONOXIDE	a. PPM (VOL)	b. LB/HR	c.
19. NITROGEN OXIDES	a. PPM (VOL)	b. LB/HR	c.
20. ORGANIC MATERIAL	a. PPM (VOL)	b. LB/HR	c.
21. SULFUR DIOXIDE	a. PPM (VOL)	b. LB/HR	c.
22. OTHER (SPECIFY)	a. PPM (VOL)	b. LB/HR	c.

EXHAUST DATA*

23. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):		24. GAS FLOW RATE THROUGH EACH EXIT: ACFM	25. EXIT GAS TEMPERATURE:
26. EXIT DIAMETER: FT	27. EXIT HEIGHT ABOVE GRADE: FT	28. MAXIMUM HEIGHT OF NEARBY BUILDINGS: FT	29. EXIT DISTANCE FROM PLANT BOUNDARY:

*NOTE: COMPLETE THESE SECTIONS ONLY IF EMISSIONS ARE EXHAUSTED WITHOUT CONTROL EQUIPMENT.

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION AIR POLLUTION CONTROL EQUIPMENT Kiln Baghouse	FOR AGENCY USE ONLY

1. NAME OF OWNER: Ajax Cement Corporation	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER)
3. STREET ADDRESS OF EMISSION SOURCE: 123 River Street	4. CITY OF EMISSION SOURCE: Clearview

ADSORPTION SYSTEM

1. FLOW DIAGRAM DESIGNATIONS OF ADSORPTION SYSTEMS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. ADSORBANT:

5. NUMBER OF BEDS PER SYSTEM:

6. ADSORBANT WEIGHT PER BED: ________ LB

7. METHOD OF REGENERATION:
☐ REPLACEMENT ☐ STEAM ☐ OTHER (SPECIFY ____________________)

8. TIME ON LINE BEFORE REGENERATION: ________ MIN/BED

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE) ________

AFTERBURNER

1. FLOW DIAGRAM DESIGNATIONS OF AFTERBURNERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. FUEL: ☐ GAS ☐ OIL (________ % SULFUR)

5. BURNERS PER AFTERBURNER ________ @ ________ BTU/H EACH

6. INLET GAS TEMPERATURE: ________ °F

7. OPERATING TEMPERATURE OF COMBUSTION CHAMBER: ________ °F

8. COMBUSTION CHAMBER DIMENSIONS:
LENGTH ________ IN; CROSS SECTION ________ IN x ________ IN; OR ________ IN DIA

9. CATALYST USED? ☐ YES ☐ NO

10. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE)
PARTICULATE ________ % GASEOUS ________ %

FOR AGENCY USE ONLY

CONDENSER

FLOW DIAGRAM DESIGNATIONS OF CONDENSERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

MANUFACTURER:

3. MODEL NAME AND NUMBER:

TYPE OF COOLANT AND COOLANT FLOW PER CONDENSER:
☐ WATER (__________ GPM) ☐ AIR (__________ SCFM) ☐ OTHER (TYPE __________ FLOW RATE __________)

COOLANT TEMPERATURES: INLET ______ °F OUTLET ______ °F

6. GAS TEMPERATURES: INLET ______ °F OUTLET ______ °F

HEAT EXCHANGE AREA PER CONDENSER: __________ FT^2

8. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): __________

CYCLONE

FLOW DIAGRAM DESIGNATIONS OF CYCLONES OR MULTIPLE CYCLONES DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

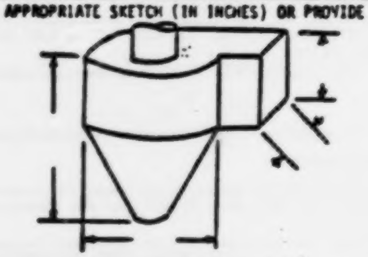
MANUFACTURER: Fuller

3. MODEL NAME AND NUMBER: Z5600

NUMBER OF CYCLONES IN EACH MULTIPLE CYCLONE: One unit of 3 cyclones

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): 95% by wt.

DIMENSION THE APPROPRIATE SKETCH (IN INCHES) OR PROVIDE A DRAWING WITH EQUIVALENT INFORMATION:



ELECTRICAL PRECIPITATOR

FLOW DIAGRAM DESIGNATIONS OF ELECTRICAL PRECIPITATORS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

MANUFACTURER:

3. MODEL NAME AND NUMBER:

COLLECTING ELECTRODE AREA PER CONTROL DEVICE: FT^2

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN RESULTS): __________

FILTER

FLOW DIAGRAM DESIGNATIONS OF FILTERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

MANUFACTURER: Fuller/Gatx

3. MODEL NAME AND NUMBER: PP50

FILTERING AREA PER CONTROL DEVICE: 8,500 FT^2

5. FILTERING MATERIAL: Glass Fiber

CLEANING:
☐ SHAKER ☒ REVERSE AIR ☐ PULSE AIR ☐ PULSE JET ☐ OTHER(SPECIFY __________)

GAS COOLING:
☐ BLEED-IN AIR(______ SCFM) ☐ WATER SPRAY (______ GPM) ☒ DUCT(LENGTH 20 FT; DIA 72x48 IN.) ☐ OTHER(SPECIFY)

INLET GAS: TEMPERATURE 325 °F; DEW POINT 130 °F

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): 99.9+

FOR AGENCY USE ONLY

SCRUBBER

1. FLOW DIAGRAM DESIGNATIONS OF SCRUBBERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APP. FORM APC-201):

2. MANUFACTURER:	3. MODEL NAME AND NUMBER:

4. SCRUBBER TYPE:

☐ HIGH ENERGY (GAS STREAM PRESSURE DROP ____________ IN H_2O)

☐ PACKED (PACKING TYPE __________; PACKING SIZE __________ IN; PACKED HEIGHT __________ IN)

☐ SPRAY (NUMBER OF NOZZLES ________; NOZZLE PRESSURE ____________ PSIG)

☐ OTHER (SPECIFY ______________ ATTACH DESCRIPTION AND SKETCH WITH DIMENSIONED DETAILS)

5. SCRUBBER GEOMETRY:
LENGTH IN DIRECTION OF GAS FLOW _____ IN; CROSS-SECTION _____ IN X _____ IN OR _____ IN DIA: ☐ CROSS FLOW ☐ COUNTER F

6. LIQUID FLOW RATE INTO SCRUBBER: ____________ GPM	7. CHEMICAL COMPOSITION OF SCRUBBANT:
8. INLET GAS TEMPERATURE: ____________ °F	9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMAT PARTICULATE __________ % GASEOUS ________

OTHER TYPES OF CONTROL EQUIPMENT

1. FLOW DIAGRAM DESIGNATION OF CONTROL EQUIPMENT DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. GENERIC NAME OF CONTROL EQUIPMENT:	3. MANUFACTURER:	4. MODEL NAME AND NUMBER:

5. ATTACH DESCRIPTION AND SKETCH OF CONTROL EQUIPMENT WITH DIMENSIONED DETAILS AND FLOW RATES.	6. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMAT PARTICULATE __________ % GASEOUS ________

MAXIMUM EMISSIONS FROM EACH IDENTICAL EXIT

CONTAMINANT	CONCENTRATION OR EMISSION RATE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
1. PARTICULATE MATTER	a. GR/SCF	b. 14.8 ☐ LB/10^6BTU ☒ LB/HR	c. EPA - Method - 5
2. CARBON MONOXIDE	a. PPM (VOL)	b. 7.5 ☐ LB/10^6BTU ☒ LB/HR	c. Coal Combustion Emission Factors A
3. NITROGEN OXIDES	a. PPM (VOL)	b. 135 ☐ LB/10^6BTU ☒ LB/HR	c. Coal Combustion Emission Factors A
4. ORGANIC MATERIAL	a. PPM (VOL)	b. 2.3 ☐ LB/10^6BTU ☒ LB/HR	c. Coal Combustion Emission Factors A
5. SULFUR DIOXIDE	a. PPM (VOL)	b. 225 ☐ LB/10^6BTU ☒ LB/HR	c. Coal Combustion Emission Factors A
6. OTHER (SPECIFY)	a. PPM (VOL)	b. ☐ LB/10^6BTU ☐ LB/HR	c.

EXHAUST DATA

1. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION(REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):		2. GAS FLOW RATE THROUGH EACH EXIT: 63,000 ACFM	3. EXIT GAS TEMPERATURE: 285
4. EXIT DIAMETER: 5 FT	5. EXIT HEIGHT ABOVE GRADE: 25 FT	6. MAXIMUM HEIGHT OF NEARBY BUILDINGS: 50 FT	7. EXIT DISTANCE FROM NEAR PLANT BOUNDARY: 700

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION PROCESS EMISSION SOURCE(A) Cement Clinker Cooler	FOR AGENCY USE ONLY

1. NAME OF PLANT OWNER: Ajax Cement Corporation

2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OW

3. STREET ADDRESS OF EMISSION SOURCE: 123 River Street

4. CITY OF EMISSION SOURCE: Clearview

GENERAL INFORMATION

5. NAME OF PROCESS: Clinker Cooling

6. NAME OF EMISSION SOURCE EQUIPMENT: Clinker Cooler

7. EMISSION SOURCE EQUIPMENT MANUFACTURER: Fuller/Gatx

8. MODEL NUMBER: 770S/925H

9. SERIAL NUMBER: N/A

10. FLOW DIAGRAM DESIGNATIONS OF EMISSION SOURCES DESCRIBED ON THIS FORM (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

11. CLEARLY IDENTIFY ANY SIMILAR SOURCES AT THE PLANT OR PREMISES NOT COVERED BY THIS FORM (IF SUCH SOURCES ARE COVERED BY FORMS CONTA IN OTHER APPLICATIONS, ALSO IDENTIFY THOSE APPLICATIONS):

12. AVERAGE OPERATION TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 52 WKS/YR

13. PERCENT OF ANNUAL THROUGHPUT: DEC/FEB 25 % MAR/MAY 25 % JUN/AUG 25 % SEP/NOV ____

RAW MATERIAL INFORMATION

14. NAMES OF RAW MATERIALS(B)	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Portland Cement Clinker	100,000 LB/HR	90,000 L
b.	LB/HR	L
c.	LB/HR	L
d.	LB/HR	L
e.	LB/HR	L
f.	LB/HR	L

(A) THIS DATA AND INFORMATION FORM IS TO BE COMPLETED FOR ANY STATIONARY EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS ANY FURNACE, BOILER, OR SIMILAR EQUIPMENT USED FOR THE PRIMARY PURPOSE OF PR DUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. FOR SUCH AN EMISSION SOURCE, COMPLETE "DATA AND INFORMATION --FUEL COMBUSTION EM SOURCE," FORM APC-240. AN INCINERATOR IS A COMBUSTION APPARATUS IN WHICH REFUSE IS BURNED. FOR SUCH AN EMISSION SOURCE, COMPLETE "DATA AND INFORMATION — INCINERATOR," FORM APC-250.

(B) COMPOSITIONS OF RAW MATERIALS MUST BE DETAILED TO THE EXTENT NECESSARY TO DETERMINE THE NATURE AND QUANTITY OF POTENTIAL EMI.

FOR AGENCY USE ONLY

PRODUCT INFORMATION

15. NAMES OF PRODUCTS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Cooled Cement Clinkers	100,000 LB/HR	90,000 L
b.	LB/HR	L
c.	LB/HR	L
d.	LB/HR	L

WASTE MATERIAL INFORMATION

16. NAMES OF WASTE MATERIALS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. None - Returned to System	LB/HR	L
b.	LB/HR	L
c.	LB/HR	L
d.	LB/HR	L

MAXIMUM EMISSIONS FROM EACH IDENTICAL SOURCE*

CONTAMINANT	CONCENTRATION OR EMISSION RATE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
17. PARTICULATE MATTER	a. GR/SCF	b. LB/HR	c.
18. CARBON MONOXIDE	a. PPM (VOL)	b. LB/HR	c.
19. NITROGEN OXIDES	a. PPM (VOL)	b. LB/HR	c.
20. ORGANIC MATERIAL	a. PPM (VOL)	b. LB/HR	c.
21. SULFUR DIOXIDE	a. PPM (VOL)	b. LB/HR	c.
22. OTHER (SPECIFY)	a. PPM (VOL)	b. LB/HR	c.

EXHAUST DATA*

23. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):		24. GAS FLOW RATE THROUGH EACH EXIT: ACFM	25. EXIT GAS TEMPERATURE:
26. EXIT DIAMETER: FT	27. EXIT HEIGHT ABOVE GRADE: FT	28. MAXIMUM HEIGHT OF NEARBY BUILDINGS: FT	29. EXIT DISTANCE FROM PLANT BOUNDARY:

*NOTE: COMPLETE THESE SECTIONS ONLY IF EMISSIONS ARE EXHAUSTED WITHOUT CONTROL EQUIPMENT.

AUG 26th 1818

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION

AIR POLLUTION CONTROL EQUIPMENT

Clinker Cooler Baghouse

FOR AGENCY USE ONLY

1. NAME OF OWNER: Ajax Cement Corp.

2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER):

3. STREET ADDRESS OF EMISSION SOURCE: 123 River Street

4. CITY OF EMISSION SOURCE: Clearview

ADSORPTION SYSTEM

1. FLOW DIAGRAM DESIGNATIONS OF ADSORPTION SYSTEMS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. ADSORBANT:

5. NUMBER OF BEDS PER SYSTEM:

6. ADSORBANT WEIGHT PER BED: ______ LB

7. METHOD OF REGENERATION: ☐ REPLACEMENT ☐ STEAM ☐ OTHER (SPECIFY ______)

8. TIME ON LINE BEFORE REGENERATION: ______ MIN/BED

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): ______ %

AFTERBURNER

1. FLOW DIAGRAM DESIGNATIONS OF AFTERBURNERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. FUEL: ☐ GAS ☐ OIL (______ % SULFUR)

5. BURNERS PER AFTERBURNER ______ @ ______ BTU/HR EACH

6. INLET GAS TEMPERATURE: ______ °F

7. OPERATING TEMPERATURE OF COMBUSTION CHAMBER: ______ °F

8. COMBUSTION CHAMBER DIMENSIONS: LENGTH ______ IN; CROSS SECTION ______ IN x ______ IN; OR ______ IN DIA

9. CATALYST USED? ☐ YES ☐ NO

10. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): PARTICULATE ______ % GASEOUS ______ %

FOR AGENCY USE ONLY

CONDENSER

1. FLOW DIAGRAM DESIGNATIONS OF CONDENSERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. TYPE OF COOLANT AND COOLANT FLOW PER CONDENSER:
☐ WATER (________ GPM) ☐ AIR (________ SCFM) ☐ OTHER (TYPE ________ FLOW RATE ________)

5. COOLANT TEMPERATURES:
INLET ______ °F OUTLET ______ °F

6. GAS TEMPERATURES:
INLET ______ °F OUTLET ______ °F

7. HEAT EXCHANGE AREA PER CONDENSER:
________ FT²

8. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
____

CYCLONE

1. FLOW DIAGRAM DESIGNATIONS OF CYCLONES OR MULTIPLE CYCLONES DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

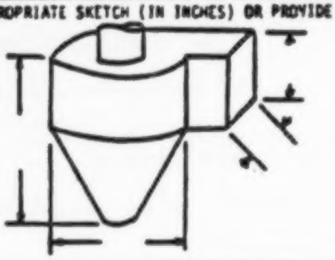
MANUFACTURER:

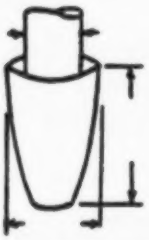
3. MODEL NAME AND NUMBER:

NUMBER OF CYCLONES IN EACH MULTIPLE CYCLONE:

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
____

DIMENSION THE APPROPRIATE SKETCH (IN INCHES) OR PROVIDE A DRAWING WITH EQUIVALENT INFORMATION:





ELECTRICAL PRECIPITATOR

FLOW DIAGRAM DESIGNATIONS OF ELECTRICAL PRECIPITATORS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

MANUFACTURER:

3. MODEL NAME AND NUMBER:

COLLECTING ELECTRODE AREA PER CONTROL DEVICE:
FT²

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN RESULTS):
____

FILTER

FLOW DIAGRAM DESIGNATIONS OF FILTERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201).

MANUFACTURER:
Fuller/GATX

3. MODEL NAME AND NUMBER:
Plenum Pulse - 156-10-1625

FILTERING AREA PER CONTROL DEVICE:
7,000 FT²

5. FILTERING MATERIAL:
Nomex

CLEANING:
☐ SHAKER ☐ REVERSE AIR ☐ PULSE AIR ☒ PULSE JET ☐ OTHER(SPECIFY ________)

GAS COOLING:
☒ BLEED-IN AIR(______ SCFM) ☐ WATER SPRAY (______ GPM) ☒ DUCT(LENGTH 25 FT; DIA 24 IN) ☐ OTHER(SPECIFY)

INLET GAS:
TEMPERATURE 350 °F; 2-22 DEW POINT 120 °F

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
99.9% + by wt.

FOR AGENCY USE ONLY

SCRUBBER

1. FLOW DIAGRAM DESIGNATIONS OF SCRUBBERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATI FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. SCRUBBER TYPE:

☐ HIGH ENERGY (GAS STREAM PRESSURE DROP ____________ IN H_2O)

☐ PACKED (PACKING TYPE __________; PACKING SIZE __________ IN; PACKED HEIGHT __________ IN)

☐ SPRAY (NUMBER OF NOZZLES __________; NOZZLE PRESSURE ____________ PSIG)

☐ OTHER (SPECIFY ______________ ATTACH DESCRIPTION AND SKETCH WITH DIMENSIONED DETAILS)

5. SCRUBBER GEOMETRY:
LENGTH IN DIRECTION OF GAS FLOW _____ IN; CROSS-SECTION _____ IN X _____ IN OR _____ IN DIA; ☐ CROSS FLOW ☐ COUNTER FLOW

6. LIQUID FLOW RATE INTO SCRUBBER: ______________ GPM

7. CHEMICAL COMPOSITION OF SCRUBBANT:

8. INLET GAS TEMPERATURE: ______________ °F

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
PARTICULATE __________ % GASEOUS __________ %

OTHER TYPES OF CONTROL EQUIPMENT

1. FLOW DIAGRAM DESIGNATION OF CONTROL EQUIPMENT DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. GENERIC NAME OF CONTROL EQUIPMENT:

3. MANUFACTURER:

4. MODEL NAME AND NUMBER:

5. ATTACH DESCRIPTION AND SKETCH OF CONTROL EQUIPMENT WITH DIMENSIONED DETAILS AND FLOW RATES.

6. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
PARTICULATE __________ % GASEOUS __________ %

MAXIMUM EMISSIONS FROM EACH IDENTICAL EXIT

CONTAMINANT	CONCENTRATION OR EMISSION RATE			METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
1. PARTICULATE MATTER	a. GR/SCF	b. .30	☐ LB/10^6BTU ☒ LB/HR	c. Source Test - EPA Method 5
2. CARBON MONOXIDE	a. PPM (VOL)	b. 7.5	☐ LB/10^6BTU ☒ LB/HR	c.
3. NITROGEN OXIDES	a. PPM (VOL)	b. 135	☐ LB/10^6BTU ☒ LB/HR	c.
4. ORGANIC MATERIAL	a. PPM (VOL)	b. 2.3	☐ LB/10^6BTU ☒ LB/HR	c.
5. SULFUR DIOXIDE	a. PPM (VOL)	b. 225	☐ LB/10^6BTU ☒ LB/HR	c.
6. OTHER (SPECIFY)	a. PPM (VOL)	b.	☐ LB/10^6BTU ☐ LB/HR	c.

EXHAUST DATA

1. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. GAS FLOW RATE THROUGH EACH EXIT: 57,200 ACFM

3. EXIT GAS TEMPERATURE: 290 °

4. EXIT DIAMETER: 4½ FT

5. EXIT HEIGHT ABOVE GRADE: 51 FT

6. MAXIMUM HEIGHT OF NEARBY BUILDINGS: 95 FT

7. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: 800 F

SUMMARY OF SOURCE OPERATION

PLANT: Ajax Cement Corporation, Clearview Plant

LOCATION: 123 River Stree, Clearview, Illinois

DATE OF TEST: June 6, 1977

TYPE OF PROCESS/EQUIPMENT: Portland Cement Kiln

Material Processed or Produced: Portland Cement Clinker

Operating Schedule: 24 Hr./Day 365* Day/Year

Maximum Operating Capacity (Include Units): 53 T/hr

Normal Operating Capacity: 45 T/hr

Operating Capacity During Test: Test 1 50T; Test 2 43T; Test 3 47T

Fuel Type: Crushed Coal % Ash: -- % Sulfur: 1.5

Amount of Fuel Consumed During Test: 22.5 T

Pollution Control System Description: Primary multicyclone; secondary positive pressure, reverse air cleaned baghouse with collected dust returned to system

Pressure Drop Across Collector: 8"

Additional Information:

* less normal down-time

SUMMARY OF PITOT TRAVERSE DATA

SHEET 1 of

PLANT: Ajax Cement Corp, Clearview Plant SOURCE: Kiln DATE: 6/

A. Stack Dimensions	5' diameter
B. Area of Stack, Sq. Ft.	19.6 $ft.^2$
C. Barometric Pressure, "Hg	29.75
D. Gage Static Pressure in Stack, "H_2O	0.15
E. Stack Gas Temperature, Dry Bulb, °F	285° F
F. Percent Moisture	12%
G. Dry Gas Composition: %O_2	8.7%
%CO_2	12.6%
%CO	0.2%
%N_2	78.5%
% other ____________	
H. Density of Dry Stack Gas, @ STP, Lbs./Cu. Ft.	0.079
I. Density of Moist Stack Gas, @ STP, Lbs./Cu. Ft.	0.075
J. Density of Moist Stack Gas, @ Stack Conditions, Lbs./Cu. Ft.	0.053
K. Total Number of Traverse Points	12
L. Pitot Tube Calibration Factor	0.82
M. Average Square Root Velocity Head of all Traverse Points	0.80
N. Average Gas Velocity, Feet/Min.	3200
O. Stack Gas Flow Rate:	
1. @ Stack Conditions, Wet, ACFM	63,000
2. @ Standard Conditions, Wet, SCFM	44,750
3. @ Standard Conditions, Dry, DSCFM	39,500

STP = 70°F, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

SUMMARY OF PARTICULATE SAMPLING DATA

SHEET 1 of 2

PLANT: Ajax Cement Corporation SOURCE: Kiln DATE: 6/6/77

A.	Sample Number	1	2	3	
B.	Number of Points Sampled	12	12	12	
C.	Total Duration of Sample, Min.	60	60	60	
D.	Nozzle Diameter, In.	.260	.260	.260	
E.	Nozzle Area, Sq. Ft.	.000369	.000369	.000369	
F.	Calibration Factors				
	1. Probe Pitot Tube	.82	.82	.82	
	2. Gas Meter	2.07	2.07	2.07	
G.	Barometric Pressure, "Hg.	29.75	29.75	29.75	
H.	Gage Static Pressure in Stack, "H_2O	.16	.15	.14	
I.	Stack Gas Temperature, °F (Ave)	275	285	295	
J.	Average Square Root Velocity Head of Points Sampled				
K.	Average Gas Meter Temperature, °F	88.2	91.8	89.6	
L.	Average Gas Meter Pressure, "H_2O	.716	.743	.785	
M.	Gas Meter Volume, Actual, Cu. Ft.	63.2	63.9	62.9	
N.	Gas Meter Volume, @ STP, Cu. Ft.	62.3	62.5	61.9	
O.	Liquid Volume of Water Condensed, ML.	171	190	160	
P.	Vapor Volume of Water Condensed at STP, Cu. Ft.	8.5	8.9	7.8	
Q.	Total Gas Sampled Through Nozzle, @ STP, Cu. Ft.	70.8	71.4	69.7	
R.	Percent Moisture in Stack				

SUMMARY OF PARTICULATE SAMPLING DATA

SHEET 2 of 2

S. Particulate Concentration				
1. Grains/Dry Standard Cubic Feet	0.04	0.05	0.04	
2. Lbs./Hr.	14.0	16.0	15.0	
T. Percent Isokinetic	101	102	98	

STP = 70°F, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

SUMMARY OF SOURCE OPERATION

PLANT: Ajax Cement Corporation, Clearview Plant

LOCATION: 123 River Street, Clearview, Illinois

DATE OF TEST: June 6, 1977

TYPE OF PROCESS/EQUIPMENT: Portland Cement Clinker Cooler

Material Processed or Produced: Portland Cement Clinker

Operating Schedule: 24 Hr./Day 365* Day/Year

Maximum Operating Capacity (Include Units): 50 T/hr.

Normal Operating Capacity: 45 T/hr.

Operating Capacity During Test: Test 1 40T; Test 2 47T; Test 3 44T

Fuel Type: Coal % Ash: 8.0% % Sulfur: 1.5%

Amount of Fuel Consumed During Test: 15,000 lb/hr.

Pollution Control System Description: Negative pressure, pulse cleaned baghouse with collected dust returned to system

Pressure Drop Across Collector: 8"

Additional Information:

* less normal down-time

SHEET 1 of 1

SUMMARY OF PITOT TRAVERSE DATA

PLANT: Ajax Cement Corp., Clearview Plant SOURCE: Clinker Cooler DATE: 6/6/77

A. Stack Dimensions	4½ diameter
B. Area of Stack, Sq. Ft.	15.9 ft.^{2}
C. Barometric Pressure, "Hg	29.80
D. Gage Static Pressure in Stack, "H_2O	0.22" W.C.
E. Stack Gas Temperature, Dry Bulb, °F	290
F. Percent Moisture	11%
G. Dry Gas Composition: %O_2	9.2%
%CO_2	12.1%
%CO	0.2%
%N_2	78.5%
% other ____	
H. Density of Dry Stack Gas, @ STP, Lbs./Cu. Ft.	0.079
I. Density of Moist Stack Gas, @ STP, Lbs./Cu. Ft.	0.075
J. Density of Moist Stack Gas, @ Stack Conditions, Lbs./Cu. Ft.	0.053
K. Total Number of Traverse Points	12
L. Pitot Tube Calibration Factor	0.82
M. Average Square Root Velocity Head of all Traverse Points	0.81
N. Average Gas Velocity, Feet/Min.	3600
O. Stack Gas Flow Rate:	
1. @ Stack Conditions, Wet, ACFM	57,200
2. @ Standard Conditions, Wet, SCFM	40,100
3. @ Standard Conditions, Dry, DSCFM	35,700

TP = 70°F, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

SUMMARY OF PARTICULATE SAMPLING DATA SHEET 1 of 2

PLANT: Ajax Cement SOURCE: Clinker Cooler DATE: ______

A. Sample Number	1	2	3	
B. Number of Points Sampled	12	12	12	
C. Total Duration of Sample, Min.	60	60	60	
D. Nozzle Diameter, In.	.260	.260	.260	
E. Nozzle Area, Sq. Ft.	.000369	.000369	.000369	
F. Calibration Factors				
1. Probe Pitot Tube	.82	.82	.82	
2. Gas Meter	2.07	2.07	2.07	
G. Barometric Pressure, "Hg.	29.80	29.80	29.80	
H. Gage Static Pressure in Stack, "H_2O	.11	.12	.12	
I. Stack Gas Temperature, °F (Ave)	280	290	300	
J. Average Square Root Velocity Head of Points Sampled	.80	.81	.82	
K. Average Gas Meter Temperature, °F	88.2	91.8	89.6	
L. Average Gas Meter Pressure, "H_2O	.716	.743	.785	
M. Gas Meter Volume, Actual, Cu. Ft.	51.6	51.9	53.3	
N. Gas Meter Volume, @ STP, Cu. Ft.	49.7	50.0	51.4	
O. Liquid Volume of Water Condensed, ML.	130	138	141	
P. Vapor Volume of Water Condensed at STP, Cu. Ft.	6.1	6.2	6.4	
Q. Total Gas Sampled Through Nozzle, @ STP, Cu. Ft.	55.8	56.2	57.8	
R. Percent Moisture in Stack				

SUMMARY OF PARTICULATE SAMPLING DATA SHEET 2 of 2

S. Particulate Concentration				
1. Grains/Dry Standard Cubic Feet	.09	.08	.09	
2. Lbs./Hr.	30	25	32	
T. Percent Isokinetic	105.6	102.6	105.9	

STP = 70°F, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

STUDENT EXERCISE NO. 3

CASE STUDY EXERCISE

TRIAL OF OPACITY AND TSP VIOLATIONS

LESSON 11

CASE STUDY

TRIAL OF OPACITY AND TSP VIOLATIONS

GOAL. This lesson (exercise) is intended to provide a background against which the students may test their own ability to develop a trial strategy, both for prosecution and defense, and to provide court room testimony.

OBJECTIVES. At the end of this lesson, the student should be able to:

1. Differentiate between good and poor trial strategy.
2. Differentiate between testimony well given and poorly given.

CASE STUDY EXERCISE

TRIAL OF OPACITY AND TSP VIOLATION

I. CASE HISTORY

The Columbia Smelting Company, a large corporation engaged in metals refining, smelting, and production has been sued by the State of Columbia for violations of the state's rules and regulations governing opacity* and suspended particulate** matter. You are a field enforcement officer assisting in preparing the case for trial. The attached investigator's report is one of the violations alleged in your plaintiff's original petition in State v. Columbia Smelting Company.

The effective and successful prosecution of this case will mostly depend on how thoroughly both the attorney and the witnesses prepare the trial. Thorough preparation requires a trial outline containing the following:

1. A thorough analysis of your case.
2. Your trial strategy plan detailing the facts and points of law you want to establish, the evidence and witnesses you want to introduce, and the order and manner of introducing them.
3. Anticipation of the defense attorney's possible strategies and efforts to undermine your case and deciding how to block or neutralize his defense.

* Rule 103.1 Assume plant built prior to Jan. 31, 1972.
** Rule 105.2

II. BACKGROUND ON STATE VS. COLUMBIA SMELTING CO.

Prior to the initiation of action against Columbia Smelting Co. (COSMO), the State Air Control Board had been conducting routine investigations of the plant and had reviewed the emissions inventory data submitted by the company. Most of the investigations revealed violations of the State's suspended particulate and opacity regulations. In fact, during the year immediately preceding the filing of the suit, COSMO had received five notices of violation from the State Air Control Board.

After the second notice of violation, COSMO was called in for a conference to determine when compliance could be achieved. COSMO's general manager insisted that the company was doing everything it could and that the State's tests were probably defective. After the third notice of violation was issued, COSMO said it would look into the matter. When compliance was not forthcoming after the fifth violation, the State decided to file suit.

III. INSTRUCTIONS

The objective of the exercise is to give each student team an opportunity to develop strategy for prosecution and defense and then to test the strategy by mock trial method. Only one witness will be heard, the FED.

The students will work in groups of three to six depending on the number of students in the class. Each Team will be assigned, by lot, to prosecute or defend the violation. A Team will be assigned either opacity or TSP.

After receiving the above assignment, each Team will organize into roles and select one member for each of the following:

Prosecution	Defense
1 Chief Prosecutor	1 Defense Attorney
1 FED	1 Technical Advisor
1 Chief of Enforcement	1 Assistant Defense Attorney

If more persons are added, they are assigned by the team leader to any appropriate role.

IV CASE PREPARATION

Each team is to study the investigator's report, the background of the case, the history of the violations, and the applicable regulations. Each team will then plan the prosecution or the defense strategy for either the opacity or the TSP violation as assigned. Each team will then organize their strategy into a series of five questions to be asked on direct examination by the prosecution and five questions to be asked by the defense on cross-examination. Extra questions should be prepared in case the opposition objects and the objection is sustained. The FED is to be the only witness heard during the demonstration.

In addition to the questions, the prosecution and defense should each prepare a one minute opening statement.

In order to save time, it is assumed that five questions establishing the identity and qualifications of the FED have been asked with the responses as shown:

1. Q. Please state your name and address.

   A. My name is George Plohm. I live at 1269 Elm St., Kingsman, Columbia.

2. Q. What is your position of employment?

   A. I am a field enforcement officer for the Columbia Air Control Board.

3. Q. How long have you been employed in your present capacity?

   A. 5 years and 6 months.

4. Q. What are your duties as a field enforcement officer?

   A. Plohm recites his duties as an FED.)

5. Q. Please describe your educational background, your training and qualifications as a field enforcement officer.

   A. Graduation, Columbia Two year Technical College Associate degree in Environmental Studies.

   Inservice Training Program, Columbia Air Control Board, three months at beginning of employment.

   Two years as assistant FED.

   Three and one-half years as senior FED.

   Certified Smoke Reader. Date of last certification 9/20/78.

V. DEMONSTRATION

After sixty minutes of preparation, the opacity team, chosen by lot, begins with the FED as the prosecuting witness taking the stand. It is to be assumed that the FED has been sworn as a witness. The prosecution begins with an opening statement, no longer than one minute duration.

After this opening statement, it is assumed that the witness (the FED) will have been asked the five stated questions and that he gave the indicated answers.

Now the prosecuting attorney will begin to interrogate his witness (the FED) and he will be permitted to ask five questions not counting questions objected to and sustained. Because of time constraints, a maximum of eight minutes will be allowed for direct examination.

At the end of the five prosecution questions, the defense will begin his five questions of cross-examination. Same rules regarding objections and time will apply.

While objections are allowed, each side is asked to make restrained use of this privilege to conserve time.

The judge will be the legal instructor who will rule on the objections.

At the end of the cross-examination, the following takes place:

(a) The prosecutor sums up his case in two minutes.
(b) The defense attorney sums up his case in two minutes.
(c) The prosecutor has a rebuttal, if he wishes, for one minute.

TSP violation. Repeat the procedure for opacity.

After both cases are "heard", the teams who were not put on the stand will have their "chief attorneys" give their strategy stressing where it differed from that taken by the demonstrating teams.

V. DISTRIBUTION OF ACTUAL CASE HISTORY AND INJUNCTION

After this presentation of the actual trial questions, the instructor (judge) calls for open student discussion or questions.

VI. DISCUSSION AND SUMMARY

When discussion is exhausted or time begins to run out, the instructor "critiques" the mock testimony and summarizes the lesson.

Trial of an Opacity and Suspended Particulate Matter Violation

The City of Kingsman
and State of Columbia

Plaintiffs

v.

The Columbia Smelting Company (COSMO)

Defendant

SECTION II - INVESTIGATOR'S REPORT

STATE OF COLUMBIA AIR CONTROL BOARD

NAME: COLUMBIA SMELTING COMPANY DATE OF INVESTIGATION 1/15/79
(company or person occupying permises) TIME: 1110 to 1430

ADDRESS: 3300 N. Sylvania CITY: Kingsman, Columbia

PREMISES USED FOR: Iron Casting and Foundry

REASON FOR REPORT: Request to investigate for compliance

TYPE OF POLLUTANT: Particulate & Smoke TYPE OF AIR SAMPLE TAKEN: Hi-Vol. (sheltered)

PERSON CONTACTED AT PREMISES INVESTIGATED: Mr. Norris Gallo TITLE: Chief Engineer

STATEMENT OF PERSON CONTACTED: Mr. Norris Gallo stated that afterburners are being used to control emissions from the cupola stacks. Mr. Gallo said that a wet scrubber for the shake-out system is being installed. Consideration is being given to installation of bag-houses on the new shotblast machines and to elimination of sand blasting.

INVESTIGATOR'S FINDINGS: At the time of this investigation, the sky was clear with variable wind bearing 160° to 190° at 4-10 mph. A grayish white smoke with an average opacity of 80% was emanating from the cupola stacks. The primary source of emissions appeared to be coming from the cupola stack; however, some emission was observed emanating from open doors of buildings located adjacent to the cupola stacks.

High volume sampling results are as follows:

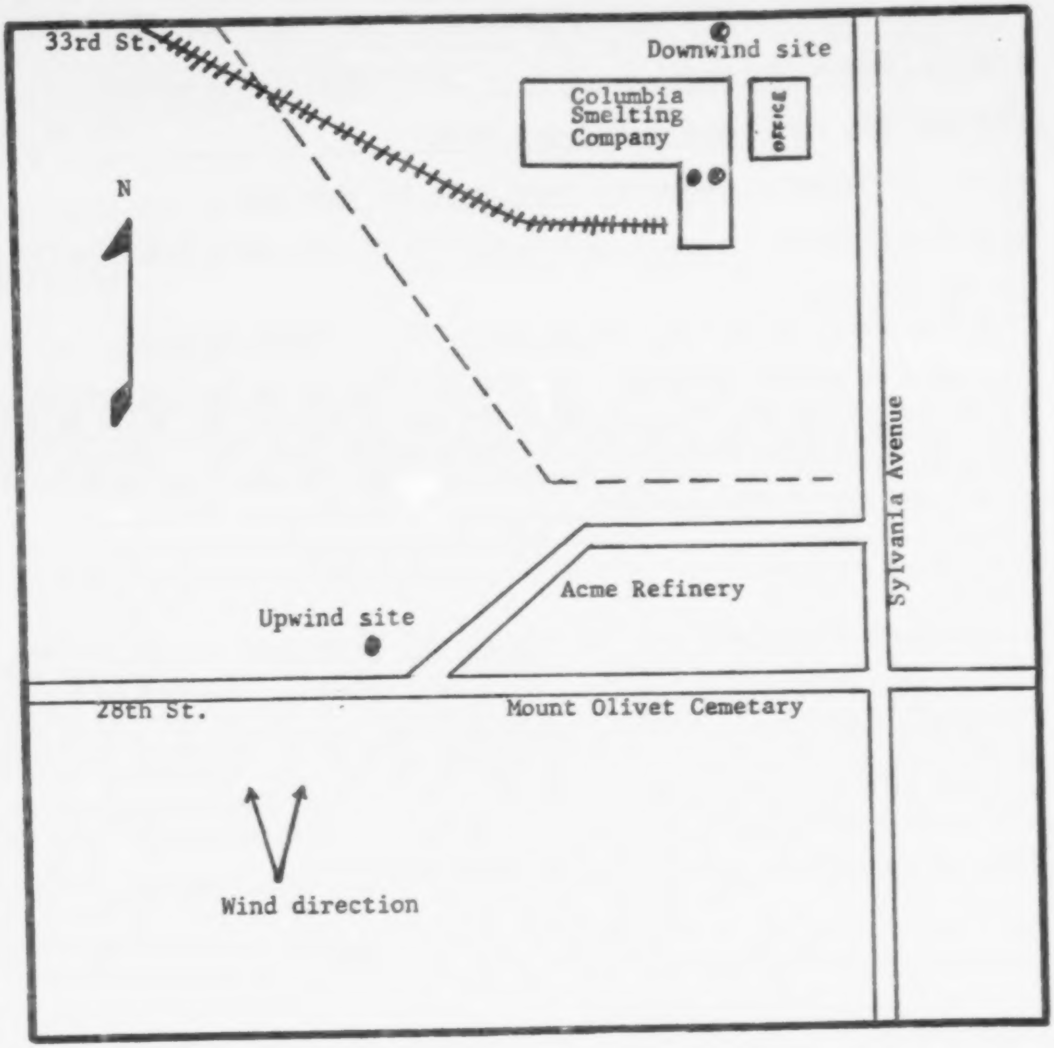
1/15/79	Downwind	698 ug/M^3
1/15/79	Upwind	52 ug/M^3

RECOMMENDATIONS: Recommend that COSM install, operate, and maintain abatement controls in such a manner so as to comply with the regulations of the State Air Control Board.

BY: George P. John TITLE F.H.S. DATE 1/16/79
George P. John

INVESTIGATOR'S REPORT continued

Use grid to draw and record pertinent physical information, e.g., North, streets, buildings, factories, emission sources, vegetation, damage, etc.


33rd St.
Downwind site
Columbia Smelting Company
OFFICE
N
Sylvania Avenue
Acme Refinery
Upwind site
28th St.
Mount Olivet Cemetary
Wind direction

Drawn By:

Scale: 1" = approx 200 yds

Date: 1/16/79

Remarks:

Wind Direction and Speed: 160° to 190° at 4-10mph

Prevailing Wind: Southerly

Land Use: Residential ___ Industrial X

Commercial X Open ___

---------- property line

● Cupola Stack

AIR POLLUTION SAMPLE REPORT

Name of Property Sampled: COLUMBIA SMELTING COMPANY

Address: 3300 N. Sylvania

City: Kingsman County: Kingsman Region: II

Type of Industry: Foundry

Name and Title of Party Contacted at Property: Mr. Norris Gallo, Chief Eng.

Sampled by: George Plohn & Charles Herd Plant Status: 100%

Remarks:

Please analyze as checked below.

Date: 1/15/79 Requested by: George Plohn

Date Coll. / Field No.	SAMPLE IDENTITY				LAB. ANALYSIS (Indicate Desired)	
	SAMPLING EQUIPMENT	TIME Start End Total Min.	SAMPLE RATE Total Volume	WIND Direction Speed	LAB. NO. Part. No. Chem. No.	SUSP. PART. (ug/M^3)
1/15/79 Upwind	Hi-Vol. (Shelt.)	1130 1430 180 min.	$\frac{53+53}{2}=53$CFM 288 M^3	160°-190° 4-10 mph	1-17-20	52
1/15/79 Downwind	Hi-Vol. (Shelt.)	1110 1410 180 min.	$\frac{61+57}{2}=59$CFM 301 M^3	160°-190° 4-10 mph	1-17-19	698

Remarks:

Date Received: 1/16/79 Date Reported: 1/16/79 By: G. Plohn
P.E., Engineer

STATE AIR CONTROL BOARD

PLUME OBSERVATION RECORD FORM

Name of source: Columbia Smelting Co.

Address: 3300 N. Sylvania
Kingsman, Columbia

Date: 1/15/79

Observer: George Plohn

Start time: 1340

Observation point: 33rd Street

Distance from stack: 900 feet

Wind speed: 8 mph direction: 190°

Type of background: Cloudy Sky

Color of Emission: Grayish White

Type of installation: Cupola

Observation ended: 1346

Smoke Density Tabulation
No. Units X Equiv. No. 1 Units

	Units No. 0	
	Units No. ½	
	Units No. 1	
	Units No. 1½	
	Units No. 2	
	Units No. 2½	
	Units No. 3	
	Units No. 3½	
24	Units No. 4	96.0
	Units No. 4½	
	Units No. 5	
	Total Units	

Total Equiv. No. 1 Units =

Average Smoke Density =

$$\frac{\text{Equiv. No. 1 Units} \times 20\%}{\text{Total Units}}$$

= 80%

Sec. / Min.	0	15	35	45	
0	4	4	4	4	
1	4	4	4	4	
2	4	4	4	4	
3	4	4	4	4	
4	4	4	4	4	
5	4	4	4	4	

Remarks:

Signed: George Plohn

STATE AIR CONTROL BOARD

SAMPLING DATA AND PLANT OPERATIONAL STATUS

Date: 1/15/79

Firm name: Columbia Smelting Company

Location of plant: 3300 N. Sylvania

Type of operation: Manufacturing Plant

SAMPLING DATA: *

Type of Sample	Location	Duration
Hi-Vol. (Sheltered)	Upwind	From: 1130 to 1430
Hi-Vol. (Sheltered)	Downwind	From: 1110 to 1410

Special conditions: Sky clear with variable wind bearing 160° to 190° at 4 - 10 mph.

I certify that the above sample(s) is (are) representative of conditions at the time of the investigation:

Signature:

Title: Environmental Health Specialist

PLANT OPERATIONAL STATUS (During the sampling period)**

Process	Per Cent Capacity	Abatement Controls
Foundry	100%	Afterburners

Special Conditions:

I certify that the above statement is true to the best of my knowledge and belief:

Signature:

Title: Chief Engineer

* To be completed and acknowledged by Air Control Program representative.

** To be completed and acknowledged by plant representative. It is understood that all the above information will be considered confidential.

SECTION III - RULES AND REGULATIONS

STATE OF COLUMBIA
RULES AND REGULATIONS

FOR THE

CONTROL OF AIR POLLUTION FROM SMOKE, VISIBLE EMISSIONS, AND PARTICULATE MATTER

Rule 103. Visible Emissions.

103.1 No person may cause, suffer, allow, or permit visible emissions from any stationary flue to exceed an opacity of 30% averaged over a 5-minute period. No person may cause, suffer, allow, or permit visible emissions from any stationary flue beginning construction after January 31, 1972, to exceed an opacity of 20% averaged over a 5-minute period. Visible emissions during the cleaning of a firebox or the building of a new fire, soot-blowing, equipment changes, ash removal and rapping of precipitators may exceed the limits set forth in Rule 103.1 for a period aggregating not more than five minutes in any sixty consecutive minutes, nor more than six hours in any ten-day period.

103.2 No person may cause, suffer, allow, or permit visible emissions from a waste gas flare for more than five minutes in any 2-hour period except as provided in Rule 12.1 of the General Rules.

103.3 No person may cause, suffer, allow or permit excessive visible emissions from any building or enclosed facility.

103.4 No person may cause, suffer, allow, or permit excessive visible emissions from motor vehicles for more than ten consecutive seconds.

103.5 No person may cause, suffer, allow, or permit excessive visible emissions from any railroad locomotive, ship, or any other vessel, except during reasonable periods of engine start-up.

103.6 No person may cause, suffer, allow, or permit visible emissions from any stationary flue having a total flow rate of 100,000 acfm or more to exceed an opacity of 15% averaged over a 5-minute period unless an optical instrument capable of measuring the opacity of emissions is installed in the flue. Records of all such measurements shall be retained as provided for in Rule 9 of the General Rules. The provision shall not apply to flues having gas streams containing moisture which interferes with proper instrument operation, if so determined by the Executive Secretary.

103.7 Contributions from uncombined water shall not be included in determining compliance with Rule 103. The burden of proof which establishes the applicability of Rule 103.7 shall be upon the person seeking to come within its provisions.

Rule 104. Particulate Matter From Materials Handling, Construction, and Roads.

104.1 Rule 104 shall apply only in Standard Metropolitan Statistical Areas where the Federal air quality standards for particulate matter are exceeded.

104.2 No person may cause, suffer, allow, or permit any fine material to be handled, transported, or stored without taking at least the following precautions to prevent particulate matter from becoming airborne:

104.21 Application of water or suitable chemicals or some other covering on materials stockpiles, and other surfaces which can create airborne dusts under normal conditions.

104.22 Installation and use of hoods, fans and filters to enclose, collect, and clean the emissions of dusty materials.

104.23 Covering or wetting at all times when in motion, of open-bodied trucks, trailers, or railroad cars transporting materials in areas where the general public has access which can create airborne particulate matter.

104.3 No person may cause, suffer, allow or permit a building structure to be used, constructed, altered, repaired or demolished without taking at least the following precautions to prevent particulate matter from becoming airborne:

104.31 Use of water or chemicals where feasible for control of dust in the demolition of buildings or structures, in construction operations, or in the clearing of land.

104.32 Use of adequate methods to prevent airborne particulate matter during sandblasting of buildings or other similar operations.

104.4 No person may cause, suffer, allow, or permit a road to be used, constructed, altered, or repaired without taking at least the following precautions to prevent particulate matter from becoming airborne:

104.41 Application of asphalt, oil, water or suitable chemicals on heavily traveled dirt streets as necessary.

104.42 Paving of public or commercial parking surfaces having more than five parking spaces.

104.43 Removal as necessary from paved street and parking surfaces of earth or other material which have a tendency to become airborne.

104.5 Alternate means of control may be approved by the Executive Secretary of the State Air Control Board.

Rule 105. Particulate Matter

105.1 No person may cause, suffer, allow, or permit emissions of particulate matter from any source to exceed the allowable rates specified in Table 1 and/or Figure 1.

105.11 If a source has an effective stack height less than the standard effective stack height as determined from Table 2 and/or Figure 2, the allowable emission level must be reduced by multiplying it by

$$\left(\frac{\text{Effective Stack Height}}{\text{Standard Effective Stack Height}}\right)^2$$

105.12 Effective stack height shall be calculated by the following equation:

$$h_e = h + 0.083 v_e D_e \left[1.5 + 0.82 \left(\frac{T_e - 550}{T_e} \right) D_e \right]$$

Where:
he = Effective stack height in feet
h = Physical stack height above ground level in feet
v_e = Stack exit velocity in feet per second
D_e = Stack exit inside diameter in feet
T_e = Stack exit temperature in degrees Rankin

105.2 No person may cause, suffer, allow or permit emissions of particulate matter from a source or sources operated on a property or from multiple sources operated on contiguous properties to exceed any of the following net ground level concentrations:

105.21 One hundred (100) micrograms per cubic meter (ug/m^3) of air sampled, averaged over any five consecutive hours.

105.22 Two hundred (200) micrograms per cubic meter (ug/m^3) of air sampled, averaged over any three consecutive hours.

105.23 Four hundred (400) micrograms per cubic meter (ug/m^3) of air sampled, averaged over any one hour period.

105.3 Rules 105.1 and 105.2 shall not apply to solid fossil fuel fired steam generators.

105.31 No person may cause, suffer, allow, or permit emissions of particulate matter from any solid fossil fuel fired steam generator to exceed 0.3 lb. per million B.T.U. heat input.

Rule 106. Transient Operations.

106.1 Rules 103 and 105 shall not apply to portable hot-mix asphaltic concrete plants, portable rock-crushers, and other transient operations engaged in public works projects which are not operated at the same premise for more than six months if all the following conditions are met:

106.11 The plant is located at least one mile outside the nearest corporate limits of any city or town.

106.12 The plant is located at least one mile from any occupied facility or recreational area other than that located on the same property as the plant.

106.13 The plant is equipped with cyclones, or wet scrubbers, or water sprays at the material transfer points open to the atmosphere, or other equipment or systems approved by the Executive Secretary, properly installed, in good working order and in operation.

106.2 The time requirement for Rule 106.1 may be extended by the Executive Secretary upon written request.

106.3 All emissions from sources operating under provisions of Rule 106 shall be controlled so as not to permit or create a nuisance.

106.4 Rule 106 shall not apply to portable hot-mix asphaltic concrete plants after December 31, 1974.

Rule 107. Agricultural Process.

107.1 Rules 103, 104, 105 and 108 shall not apply to any person affected by Section 3.10 (e) of the State Clean Air Act.

107.2 No person affected by Section 3.10 (e) of the State Clean Air Act may cause, suffer, allow, or permit emissions of particulate matter from any or all sources associated with a specific process to exceed the allowable levels specified in Table 3 and/or Figure 3, except as provided by Rule 107.3.

107.3 Any person affected by Section 3.10 (e) of the State Clean Air Act who does not wish to be controlled by the process weight method, established by Rule 107.2, may select an alternate method of control which the Executive Secretary finds will provide emission control efficiency and measurement to achieve the same goal as Rule 107.2.

107.4 Any person affected by Section 3.10 (e) of the State Clean Air Act who does not select an alternate method and notify the Executive Secretary, in writing, prior to any plant investigation by the staff of the State Air Control Board, shall be controlled by the process weight method established by Rule 107.2, unless the Executive Secretary, at his discretion, chooses to accept proposals for an alternate method at that time.

107.5 Nothing herein is intended to affect the limitations on burning set out in Rule 101.

107.6 Persons affected by Rule 107 shall be in compliance with the provisions set forth herein by February 15, 1973.

Rule 108. Persons affected by this regulation shall be in compliance with the provisions contained herein no later than December 31, 1973. Not later than six months after the effective date of this regulation, any person affected by this regulation shall submit to the State Air Control Board a written report on his compliance status, including but not limited to, the minimum time required to design, procure, install and test abatement equipment or procedures. Progress reports shall be submitted to the Board every four months commencing in July of 1972 until compliance is achieved.

All persons shall continue to be governed by the provisions of Regulation I, which became effective on March 16, 1967, and amended on January 23, 1968, September 12, 1969, and May 18, 1971, and Regulation II, which became effective February 22, 1968, and amended on September 12, 1969, until December 31, 1973, at which time this regulation shall supersede the previous Regulations I and II.

TABLE 1

ALLOWABLE PARTICULATE EMISSION RATES FOR SPECIFIC FLOW RATES

Effluent Flow Rate acfm	Rate of Emission lb/hr
1,000	3.5
2,000	5.3
4,000	8.2
6,000	10.6
8,000	12.6
10,000	14.5
20,000	22.3
40,000	34.2
60,000	44.0
80,000	52.6
100,000	60.4
200,000	92.9
400,000	143.0
600,000	184.0
800,000	219.4
1,000,000	252.0

Interpolation and extrapolation of the data in this table shall be accomplished by the use of the equation $E=0.048\ (q^{0.62})$ where E is the allowable emission rate in lb/hr and q is the stack effluent flow rate in acfm.

FIGURE I

ALLOWABLE PARTICULATE EMISSION RATES

FOR SPECIFIC FLOW RATES

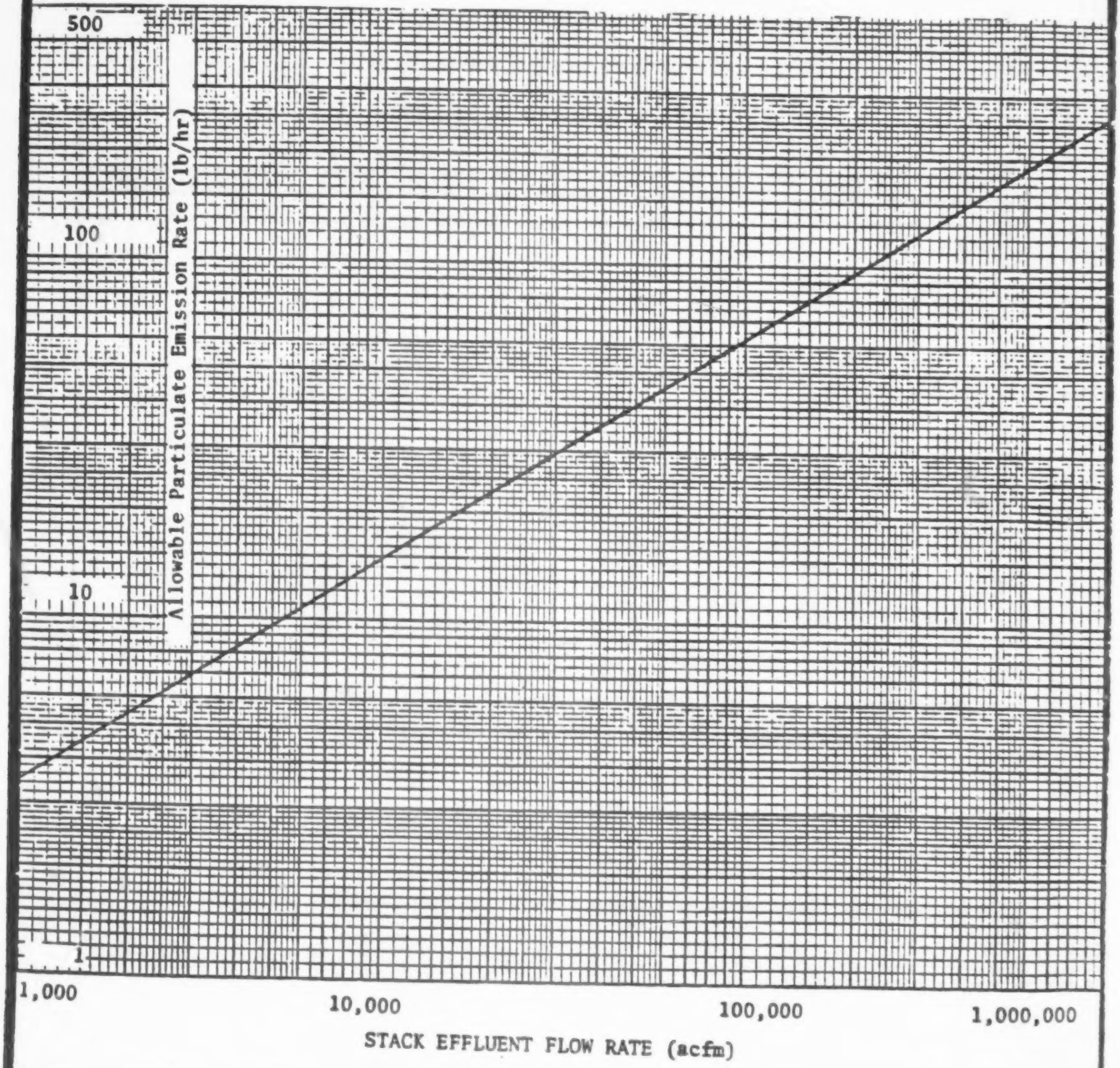


TABLE 2

STANDARD EFFECTIVE STACK HEIGHT BASED ON SPECIFIC FLOW RATES

Effluent Flow Rate acfm	Standard Effective Stack Height ft
1,000	12
2,000	15
4,000	19
6,000	22
8,000	24
10,000	26
20,000	34
40,000	43
60,000	49
80,000	55
100,000	59
200,000	75
400,000	96
600,000	110
800,000	122
1,000,000	132

Interpolation and extrapolation of the data in this table shall be accomplished by the use of the equation $H_e = 1.05 (q^{0.35})$ where H_e is the standard effective stack height in feet and q is the stack effluent flow rate in acfm.

FIGURE 2

STANDARD EFFECTIVE STACK HEIGHT

BASED ON SPECIFIC FLOW RATES

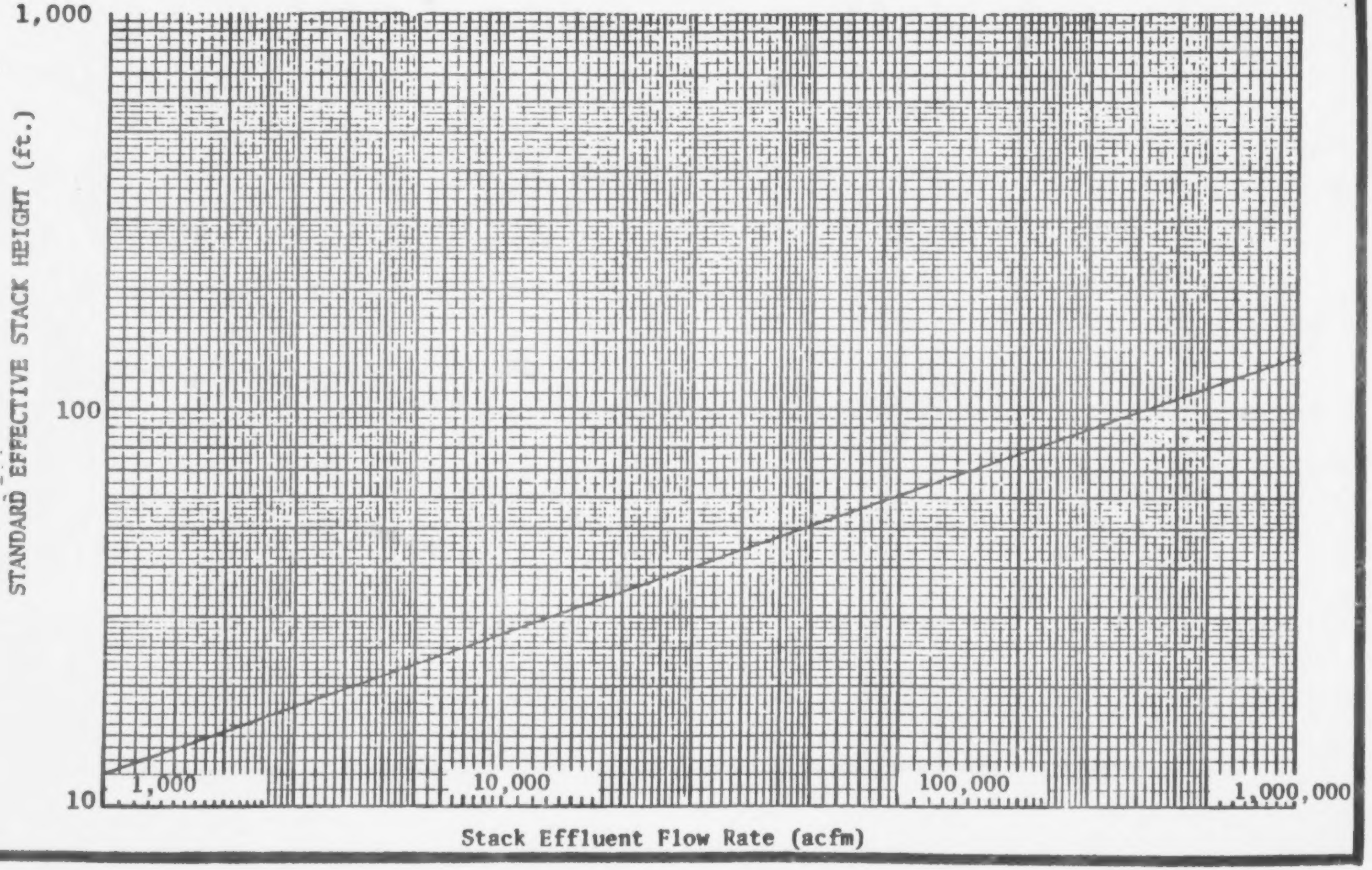


TABLE 3

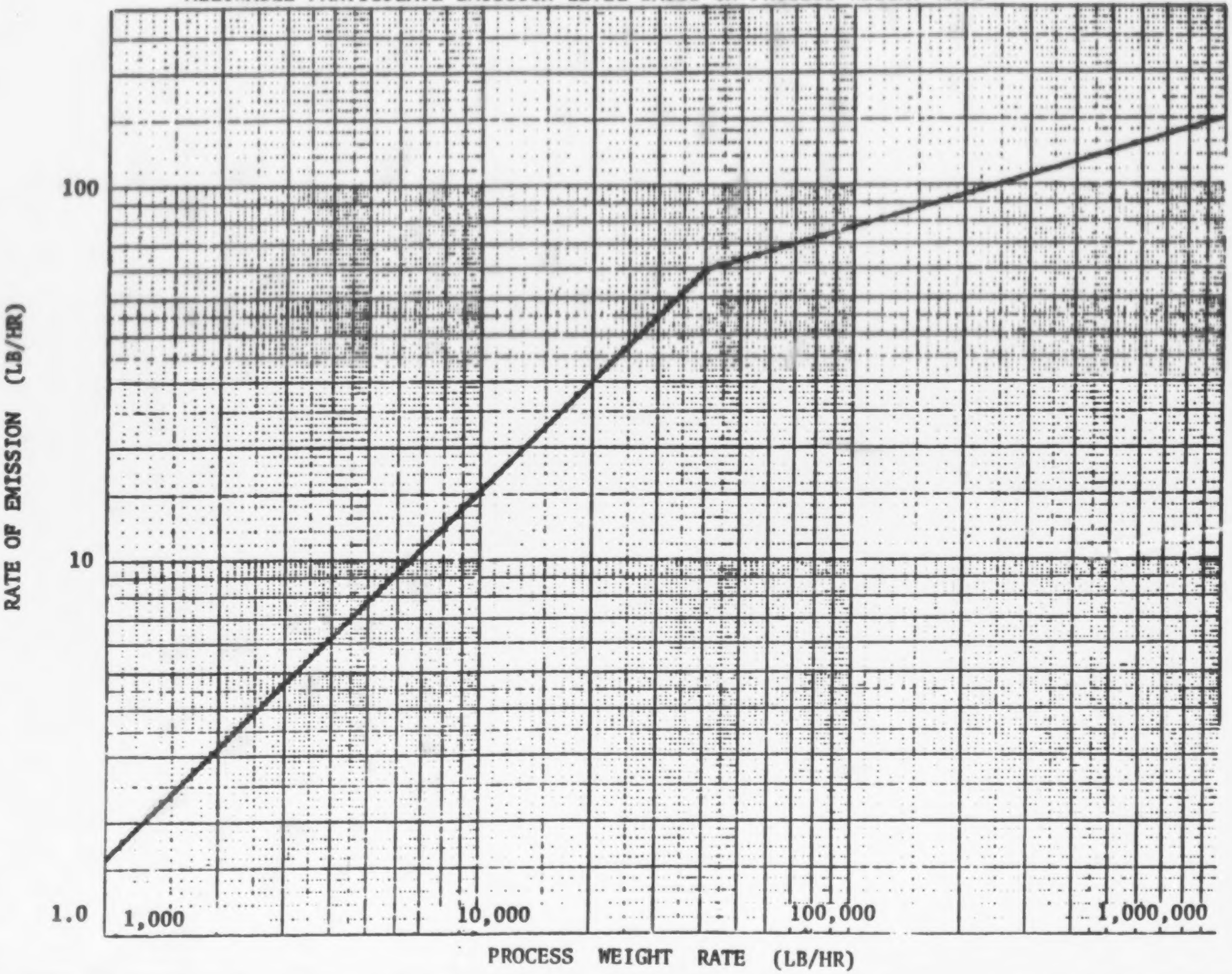
ALLOWABLE RATE OF EMISSION BASED ON PROCESS WEIGHT RATE

PROCESS WEIGHT RATE lb/hr	RATE OF EMISSION lb/hr	PROCESS WEIGHT RATE lb/hr	RATE OF EMISSION lb/hr
1,000	1.6	16,000	24.2
1,500	2.4	18,000	27.2
2,000	3.1	20,000	30.1
2,500	3.9	30,000	44.9
3,000	4.7	40,000	59.7
3,500	5.4	50,000	64.0
4,000	6.2	60,000	67.4
5,000	7.7	70,000	70.5
6,000	9.2	80,000	73.2
7,000	10.7	90,000	75.7
8,000	12.2	100,000	78.1
9,000	13.7	150,000	87.7
10,000	15.2	200,000	95.2
12,000	18.2	250,000	101.5
14,000	21.2	500,000	123.9

Interpolation of the data in this table for process weights up to 40,000 lb/hr shall be accomplished by the use of the equation $E = 3.12 (p^{0.985})$, and interpolation and extrapolation of the data for process weight rates in excess of 40,000 lb/hr shall be accomplished by use of the equation $E = 25.4 (p^{0.287})$ where E = rate of emission in pounds per hour and p = process weight rate in tons per hour.

FIGURE 3

ALLOWABLE PARTICULATE EMISSION LEVEL BASED ON PROCESS WEIGHT RATE



STUDENT EXERCISE NO. 4

COMPLAINT HANDLING

ODOR COMPLAINT CASE STUDY

LESSON 13

COMPLAINT HANDLING

ODOR COMPLAINT CASE STUDY

GOAL. To teach the principles of processing nuisance complaints with emphasis on the field investigation process.

OBJECTIVES. At the end of this exercise, the student should be able to:

1. Differentiate between good and poor complaint investigation procedures.
2. Document the procedure for investigation and case development.
3. Design an odor surveillance plan for a suspected source.
4. Differentiate between a public and a private nuisance.
5. Define the various steps in getting action from the source management to abate the cause of the complaint.

INSTRUCTIONS: No formal lecture on Complaint Handling will be given. The conduct of this lesson is a self-study of an actual odor complaint case by each student and then developing the answers to the questions at the end of the case narrative.

For reference, Chapter 13, Complaint Handling is included in the Student Manual for a reference to be used during the self-study exercise.

The case is to be read and notes made the evening of the second day of the course.

On the third day of the course, during the period following Test No. 1, the instructor will call on students at random to respond to the questions posed at the end of the case narrative. Thus, each point will be discussed.

At the end of the discussion, a summary of complaint handling will be presented to the lecturer.

After all points are discussed, an Answer Key, describing the "Collection of Data" and "Analysis of Data and Establishment of the Case" will be passed out to the students. Also distributed will be the "Disposition of the Case" giving the record of the State Agency with respect to the case.

LESSON 13

ODOR COMPLAINT CASE STUDY

SECTION I - CASE HISTORY

The following narrative is a case history of an odor complaint from the inception of the complaint to the final resolution of the problem. Odor complaints are usually challenging in that there are few, if any, agencies that have good objective standards upon which the existence of a violation can be based.

We will preface this exercise by stating that the only legal mechanism available to this agency is an ordinance that forbids air pollution and defines it as "The presence in the outdoor atmosphere of any air contaminant which is or may be inimical to health, safety or welfare; or which is or may be injurious to human, plant or animal life or property; or which unreasonably interferes with the comfortable enjoyment of life or property".

As in any air pollution problem, it is necessary that the inspector be observant, thorough, and particularly that he be capable of exercising "common sense". Although there may necessarily not be a "right" or a "wrong" way for handling odor complaints, a preferred set of procedures has evolved from experience.

Review the following information and determine to your satisfaction whether the inspector handled this complaint properly. Note both what was properly done and what, if anything, was improperly handled.

THE COMPLAINT INVESTIGATION

Field Enforcement Officer, Harry Frank, has been with the agency just over four months. He has completed his basic orientation and has had several training courses. He has had, however, little practical field experience. Due to the rapid expansion of the program and a shortage of personnel, Harry has been shoved into the field and told to do the best that he can.

On July 6, Mr. Rust of Orangeland called the regional office and complained that he and his wife had nearly become ill on the previous evening as a result of malodorous emissions from a paint plant (Alcoat Company) located near their home. Harry was assigned to the investigation.

Harry immediately went to the agency's files to determine whether or not there had been any previous complaints concerning operations of the Alcoat Company. His search of the records indicated that a similar complaint from a resident in the Orangeland area had been received approximately one week earlier. However, due to a shortage of personnel, no one had yet investigated that complaint.

The agency's files also showed that the Alcoat Company had received a permit to construct a coating plant in the complaint area approximately eighteen months previously. The permit file indicated that the company would utilize catalytic combustion units to control the emission of solvent vapors from their paint coating and baking lines. The plant construction had been completed and the plant had been operating for approximately four months. Another inspector checked the plant prior to the beginning of operation: his report had indicated that the plant was operating satisfactorily and that there were no malodors apparent in the vicinity of the plant at that time. The inspector had noted, nevertheless, that a faint solvent odor could be detected outside of the plant.

Harry next visited the complainant at his home. He observed that the Orangeland development consisted of approximately one hundred homes located on a 130 to 140 acre tract. Adjacent to the development was a small industrial park which apparently contained several manufacturing plants. As he approached the Rust residence, Harry was not able to detect any malodors. In his conversation with Mrs. Rust, Harry was told that the Rusts first became aware of the malodors approximately two weeks earlier and that the odor episodes had occurred frequently since that time. Mrs. Rust further stated that several of her neighbors had also complained about the malodors to her. She offered to supply their names and addresses. Mrs. Rust pointed out the Alcoat plant to Harry. He noted that the plant was located approximately six hundred yards away from the residential Orangeland area.

After leaving Mrs. Rust's residence, Harry drove directly to the Alcoat plant. As he approached the plant, he noted that it had five stacks. Three of the stacks had no visible emissions but two were emitting white vapor plumes. He parked and entered the plant.

Inside he was greeted by the receptionist. He identified himself and asked to see the plant manager. The receptionist placed a call and then told Harry that the plant manager was not available but that the plant engineer, Mr. Erb, would see him. Harry met Mr. Erb, again identified himself, recorded Mr. Erb's full name and position title, and advised Mr. Erb of the nature of the problem and of his agency rules and regulations pertaining to such a problem.

Mr. Erb told Harry that, to the best of his knowledge, the plant and its associated air pollution control equipment was operating satisfactorily and that there was no problem. He did indicate, however, that he, himself, had noted a slight odor as he drove by a metal-plating company approximately one mile south of his plant. He also stated that some of his workmen had informed him that several of the Orangeland residents were having trouble with their septic tanks and that might be the source of the odor.

Mr. Erb offered to show Harry the plant and took him through the manufacturing facility. Harry observed that the company coated strips of metal with paint. The paint was baked on the strips and then quenched, after which the metal was recoiled for shipment to fabricating plants. The baking ovens were each vented to separate catalytic combustion units and the quenching operations each had a separate stack; there was also a small oil-fired boiler.

Harry could detect strong paint solvent odor in the plant, but Mr. Erb informed him that this was to be expected in the immediate vicinity of so much fresh paint.

After the plant inspection and a further brief conversation with Mr. Erb, Harry left. On his way back to his office, Harry passed the metal-plating plant mentioned by Mr. Erb. He could not detect any malodors as he drove by the plant.

Upon returning to his office, Harry prepared a report which detailed his investigation. He concluded that, possibly, the Rusts were mistaken and could discover no problem that would warrant further action by the agency. Harry thought that that would be the end of the case, but it wasn't. Over the next several days, fourteen additional complaints concerning malodorous emissions in the Orangeland area were received. The complaints were brought to the attention of Harry's supervisor who reviewed Harry's investigative report. He noted various errors in the investigative technique and discussed these with Harry.

EXERCISE

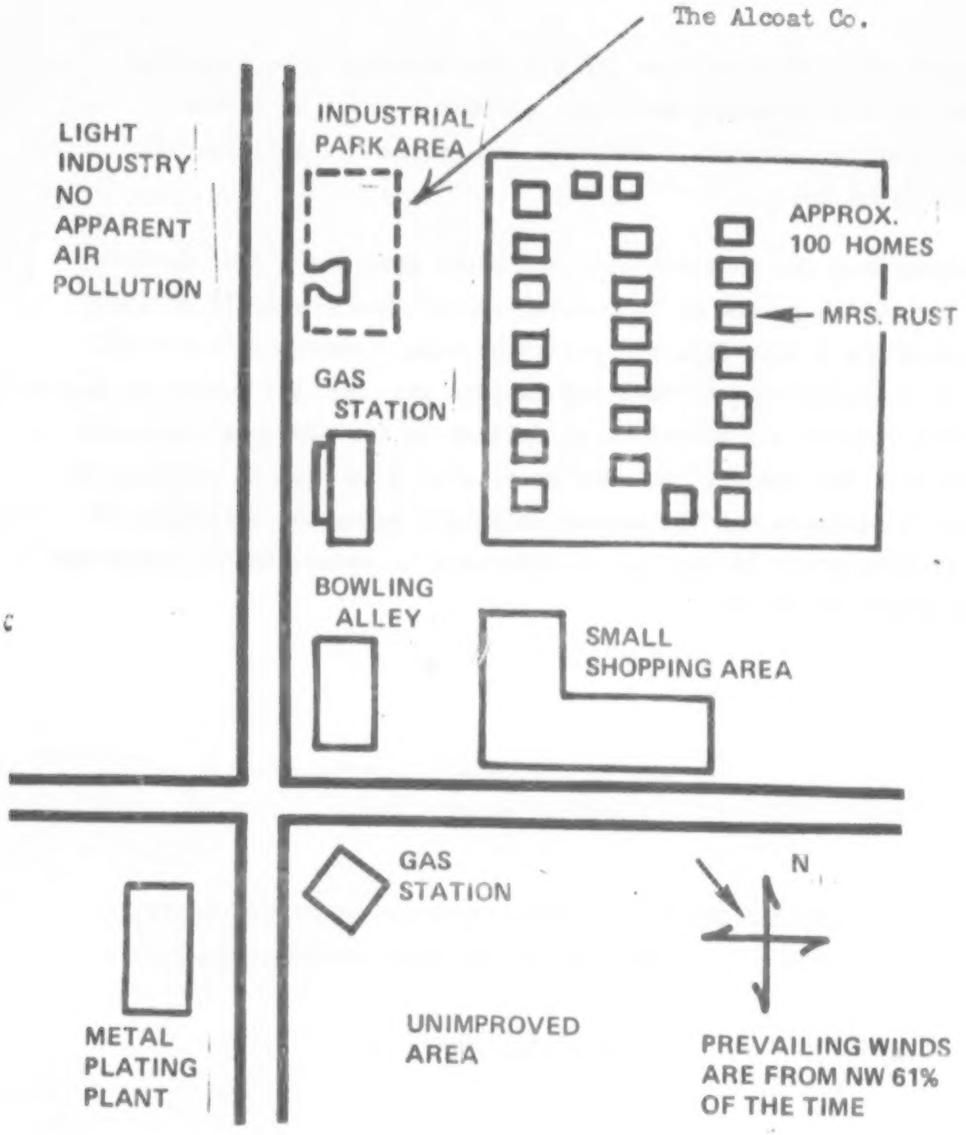
1. Assuming that Harry neither did not saw anything more than that stated in the preceding material, prepare a critique of his investigative technique. Indicate all errors and deficiencies in his technique.

2. Assuming that the investigation indicated that the Alcoat Company was indeed the source of the odors, explain how you would go about establishing a bona fide air pollution case. Remember that there are no specific odor control regulations and that the burden of proof in establishing air pollution as defined in the agency's ordinance rests with the agency. An odor problem of this type is effectively a public nuisance and the manner of establishing the existence of the problem would be similar to that used to establish the existence of a public nuisance.

AIR POLLUTION REGULATIONS
APPLYING TO THIS AREA

USE THE RULES AND REGULATIONS OF HENDERSON COUNTY,
OHIO AS APPLYING TO THE AREA OF THIS CASE STUDY.

SEE EXERCISE NO. 1


The Alcoat Co.
LIGHT INDUSTRY NO APPARENT AIR POLLUTION
INDUSTRIAL PARK AREA
APPROX. 100 HOMES
MRS. RUST
GAS STATION
BOWLING ALLEY
SMALL SHOPPING AREA
GAS STATION
N
METAL PLATING PLANT
UNIMPROVED AREA
PREVAILING WINDS ARE FROM NW 61% OF THE TIME

SCALE: 1" = 500'

STUDENT EXERCISE NO. 5

COMPLAINT INSPECTION OF AN ASPHALT CONCRETE BATCHING PLANT

FILM & WORKBOOK

LESSON 15

COMPLAINT INSPECTION OF AN ASPHALT PLANT

FILM & WORKBOOK

GOAL. To demonstrate a complaint inspection of an asphalt concrete batch plant. The student's proficiency is tested by completing inspection report forms to record conditions demonstrated in the film.

OBJECTIVES. At the end of this lesson, the student should be able to:

1. Describe the process of manufacturing asphalt concrete in a batch plant.
2. Use existing agency data to prepare for an inspection.
3. Properly obtain entry to a facility for the purpose of conducting an inspection.
4. List inspection points for asphalt plants.
5. Interface effectively with plant management and personnel so as to elicit their help and cooperation.
6. List the information which must be obtained from a complainant.
7. Interview complainants so as to obtain necessary information and maintain good will.
8. Prepare inspection report forms and other appropriate notices.

SELECTED READING: Inspection Manual for Enforcement of New Source Performance Standards.
Asphalt Concrete Plants, Reference 27.

INSTRUCTIONS. Use the same format as Lesson 6.

The film portrays a response to a citizen complaint and an inspection of the suspected source.

As in Exercise No. 2, there are various documents to be reviewed and a Data Gathering Form to be filled out as the film progresses.

At the conclusion of the film, the instructor will call on students at random for their "Response Data" and lead a discussion of the various inspection points.

Proceed to review documents in preparation for viewing the film.

SUGGESTED INSPECTION POINTS AND DATA GATHERING QUESTIONS

ASPHALT CONCRETE BATCH PLANT*

Entering plant premises

Interviewing plant manager

Reviewing data provided

The plant yard

General plant survey

The cold feed conveyor/bucket elevator transfer point

*Refer to the flow diagram at the end of this form for indicated inspection points.

The rotary dryer

The hot elevator

The mixing tower

The underside of the baghouse

The baghouse exterior

The interview with the complainant

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

APPLICATION FOR A PERMIT(A)
☐ CONSTRUCT ☒ OPERATE

NAME OF EQUIPMENT TO BE CONSTRUCTED OR OPERATED: Asphalt Batch Plant (B)

FOR AGENCY USE ONLY
I. D. NO. ____________
PERMIT NO. ____________
DATE ____________

1a. NAME OF OWNER: Scenic Valley Asphalt Corp.		2a. NAME OF OPERATOR: Same	
1b. STREET ADDRESS OF OWNER: 100 Main Street		2b. STREET ADDRESS OF OPERATOR: Same	
1c. CITY OF OWNER: Clearview		2c. CITY OF OPERATOR: Same	
1d. STATE OF OWNER: Illinois	1e. ZIP CODE: 60000	2d. STATE OF OPERATOR: Same	2e. ZIP CODE: Same

3a. NAME OF CORPORATE DIVISION OR PLANT: Scenic Valley Asphalt Corp.		3b. STREET ADDRESS OF EMISSION SOURCE: 100 Main Street		
3c. CITY OF EMISSION SOURCE: Clearview	3d. LOCATED WITHIN CITY LIMITS: ☒ YES ☐ NO	3e. TOWNSHIP: Smith	3f. COUNTY: Jones	3g. ZIP CODE: 60000

4. ALL CORRESPONDENCE TO: (NAME OF INDIVIDUAL) Gary Johnson	5. TELEPHONE NUMBER FOR AGENCY TO CALL: 800-555-1234
6. ADDRESS FOR CORRESPONDENCE: (CHECK ONLY ONE) ☒ OWNER: ☐ OPERATOR ☐ EMISSION SOURCE	7. YOUR ID NUMBER FOR THIS APPLICATION:(C) 100M1977

8. THE UNDERSIGNED HEREBY MAKES APPLICATION FOR A PERMIT AND CERTIFIES THAT THE STATEMENTS CONTAINED HEREIN ARE TRUE AND CORRECT, AND FURTHER CERTIFIES THAT ALL PREVIOUSLY SUBMITTED INFORMATION REFERENCED IN THIS APPLICATION REMAINS TRUE, CORRECT AND CURRENT. BY AFFIXING HIS SIGNATURE HERETO HE FURTHER CERTIFIES THAT HE IS AUTHORIZED TO EXECUTE THIS APPLICATION.

AUTHORIZED SIGNATURE(S):(D)

BY Gary Johnson 6/2/77
SIGNATURE DATE
Gary Johnson
TYPED OR PRINTED NAME OF SIGNER
General Manager
TITLE OF SIGNER

BY ____________ ____________
SIGNATURE DATE
____
TYPED OR PRINTED NAME OF SIGNER
____
TITLE OF SIGNER

(A) THIS FORM IS TO PROVIDE THE AGENCY WITH GENERAL INFORMATION ABOUT THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS FORM MAY ONLY BE USED TO REQUEST ONE TYPE OF PERMIT - CONSTRUCTION OR OPERATION - AND NOT BOTH.

(B) CLEARLY IDENTIFY THE GENERIC NAME OF THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. SUCH IDENTIFICATION WILL APPEAR ON THE PERMIT WHICH MAY BE ISSUED PURSUANT TO THIS APPLICATION. THIS FORM MUST BE ACCOMPANIED BY THE APPLICABLE ADDENDA.

(C) PROVIDE A NUMBER IN ITEM 7 ABOVE WHICH YOU WOULD LIKE THE AGENCY TO USE FOR IDENTIFICATION OF YOUR EQUIPMENT. YOUR IDENTIFICATION NUMBER WILL BE REFERENCED IN ALL CORRESPONDENCE, RELATIVE TO THIS APPLICATION, FROM THIS AGENCY. YOUR IDENTIFICATION NUMBER MUST NOT EXCEED TEN (10) CHARACTERS.

(D) THIS APPLICATION MUST BE SIGNED IN ACCORDANCE WITH PCB REGS., CHAPTER 2, PART 1, RULE 103(a)(4) OR 103(b)(5) WHICH STATES: "ALL APPLICATIONS AND SUPPLEMENTS THERETO SHALL BE SIGNED BY THE OWNER AND OPERATOR OF THE EMISSION SOURCE OR AIR POLLUTION CONTROL EQUIPMENT, OR THEIR AUTHORIZED AGENT, AND SHALL BE ACCOMPANIED BY EVIDENCE OF AUTHORITY TO SIGN THE APPLICATION."

IF THE OWNER OR OPERATOR IS A CORPORATION, SUCH CORPORATION MUST HAVE ON FILE WITH THE AGENCY A CERTIFIED COPY OF A RESOLUTION OF THE CORPORATION'S BOARD OF DIRECTORS AUTHORIZING THE PERSONS SIGNING THIS APPLICATION TO CAUSE OR ALLOW THE CONSTRUCTION OR OPERATION OF THE EQUIPMENT TO BE COVERED BY THE PERMIT.

9. AN OPERATING PERMIT APPLICATION MUST BE SUBMITTED IN DUPLICATE.
A CONSTRUCTION PERMIT APPLICATION FOR CONSTRUCTION IN COOK COUNTY OUTSIDE OF THE CORPORATE LIMITS OF CHICAGO MUST BE SUBMITTED IN QUADRUPLICATE.
A CONSTRUCTION PERMIT APPLICATION IN ALL OTHER LOCATIONS MUST BE SUBMITTED IN TRIPLICATE.

10. THE APPLICANT SHALL SUBMIT A PLOT PLAN AND MAP SHOWING DISTANCES TO THE NEAREST BOUNDARY OF THE PROPERTY ON WHICH THE OPERATION IS LOCATED AND DISTANCES TO THE NEAREST RESIDENCES, LODGINGS, NURSING HOMES, HOSPITALS, SCHOOLS AND COMMERCIAL AND MANUFACTURING ESTABLISHMENTS. IF SUCH A PLOT PLAN AND MAP HAS ALREADY BEEN SUBMITTED, INDICATE THE ASSOCIATED AGENCY I.D. NUMBER AND PERMIT APPLICATION NUMBER. AGENCY I.D. NO. ___ ___ ___ APPLICATION NO. _ ___ ____

11. THE APPLICANT SHALL SUBMIT A PROCESS FLOW DIAGRAM DEPICTING ALL EMISSION SOURCES AND ALL AIR POLLUTION CONTROL EQUIPMENT COVERED BY THIS PERMIT APPLICATION. THE DIAGRAM SHALL INCLUDE LABELS FOR EACH EMISSION SOURCE AND EACH ITEM OF AIR POLLUTION CONTROL EQUIPMENT, AND SHALL SET FORTH MAXIMUM FLOW RATES FOR (1) ALL PROCESSING EQUIPMENT, (2) ALL AIR POLLUTION CONTROL EQUIPMENT, (3) ALL EMISSION SOURCES, AND (4) ALL STACKS AND VENTS. NUMBER OF SHEETS: 1 DRAWING NUMBER(S): 1

12. FOR EACH EMISSION SOURCE AND EACH ITEM OF AIR POLLUTION CONTROL EQUIPMENT IDENTIFIED ON THE PROCESS FLOW DIAGRAM, THE APPLICANT SHALL COMPLETE AND SUBMIT THE APPLICABLE PERMIT APPLICATION FORMS. THE FLOW DIAGRAM SHALL INDICATE THROUGH WHICH STACK OR VENT AN EMISSION SOURCE OR ITS RELATED AIR POLLUTION CONTROL EQUIPMENT IS EXHAUSTED. IF IT IS EXHAUSTED WITHIN A BUILDING, SO INDICATE

13. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE APPLICANT IS INCORPORATING BY REFERENCE PREVIOUSLY GRANTED INSTALLATION OR CONSTRUCTION PERMITS, HE SHALL COMPLETE FORM APC-210, ENTITLED "DATA AND INFORMATION -- INCORPORATION BY REFERENCE."

14. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE STARTUP OF ANY EMISSION SOURCE DESCRIBED BY THIS APPLICATION PRODUCES AN AIR CONTAMINANT IN EXCESS OF APPLICABLE STANDARDS, THE APPLICANT MAY REQUEST PERMISSION TO EXCEED SUCH STANDARDS BY COMPLETING FORM APC-203, ENTITLED "OPERATION DURING STARTUP."

15. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, AND THE APPLICANT IS APPLYING FOR PERMISSION TO OPERATE AN EMISSION SOURCE DURING MALFUNCTIONS OR BREAKDOWNS PURSUANT TO PCB REGS., CHAPTER 2, RULE 105, THE APPLICANT MAY REQUEST SUCH PERMISSION BY COMPLETING FORM APC-204, ENTITLED "OPERATION DURING MALFUNCTION AND BREAKDOWN."

16. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT AND ALL OR ANY PART OF THE PROCESS MUST BE CONTROLLED OR MODIFIED TO COMPLY WITH APPLICABLE REGULATIONS, THE APPLICANT SHALL COMPLETE FORM APC-202, ENTITLED "COMPLIANCE PROGRAM & PROJECT COMPLETION SCHEDUL

17. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, DOES THE OPERATION COVERED BY THIS APPLICATION REQUIRE AN EPISODE ACTION PLAN? ☐ YES ☒ NO

18. WAS EACH EMISSION SOURCE COVERED BY THIS APPLICATION, AS OF APRIL 14, 1972, IN COMPLIANCE WITH THE "RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION," ADOPTED BY THE FORMER AIR POLLUTION CONTROL BOARD AND CONTINUED EFFECTIVE PURSUANT TO SECTION 49(c) OF THE ENVIRONMENTAL PROTECTION ACT? ☒ YES ☐ NO

19. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, WAS THE OPERATION THE SUBJECT OF A VARIANCE PETITION FILED WITH THE ILLINOIS POLLUTION CONTROL BOARD ON OR BEFORE JUNE 13, 1972? ☐ YES ☒ NO

IF "YES," CITE PCB NUMBER(S): ____________ DATE OF BOARD ORDER: ____________

HAD THE APPLICANT ON OR BEFORE APRIL 14, 1972, COMMENCED CONSTRUCTION OF EQUIPMENT OR MODIFICATIONS SUFFICIENT TO ACHIEVE COMPLIA WITH THE APPLICABLE LIMITATIONS OF THE "RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION," ADOPTED BY THE FORMER AIR POLLUTION CONTROL BOARD AND CONTINUED EFFECTIVE PURSUANT TO SECTION 49(c) OF THE ENVIRONMENTAL PROTECTION ACT? ☐ YES ☐ NO

IF "NO," EXPLAIN IN DETAIL AND MARK YOUR EXPLANATION AS EXHIBIT D.

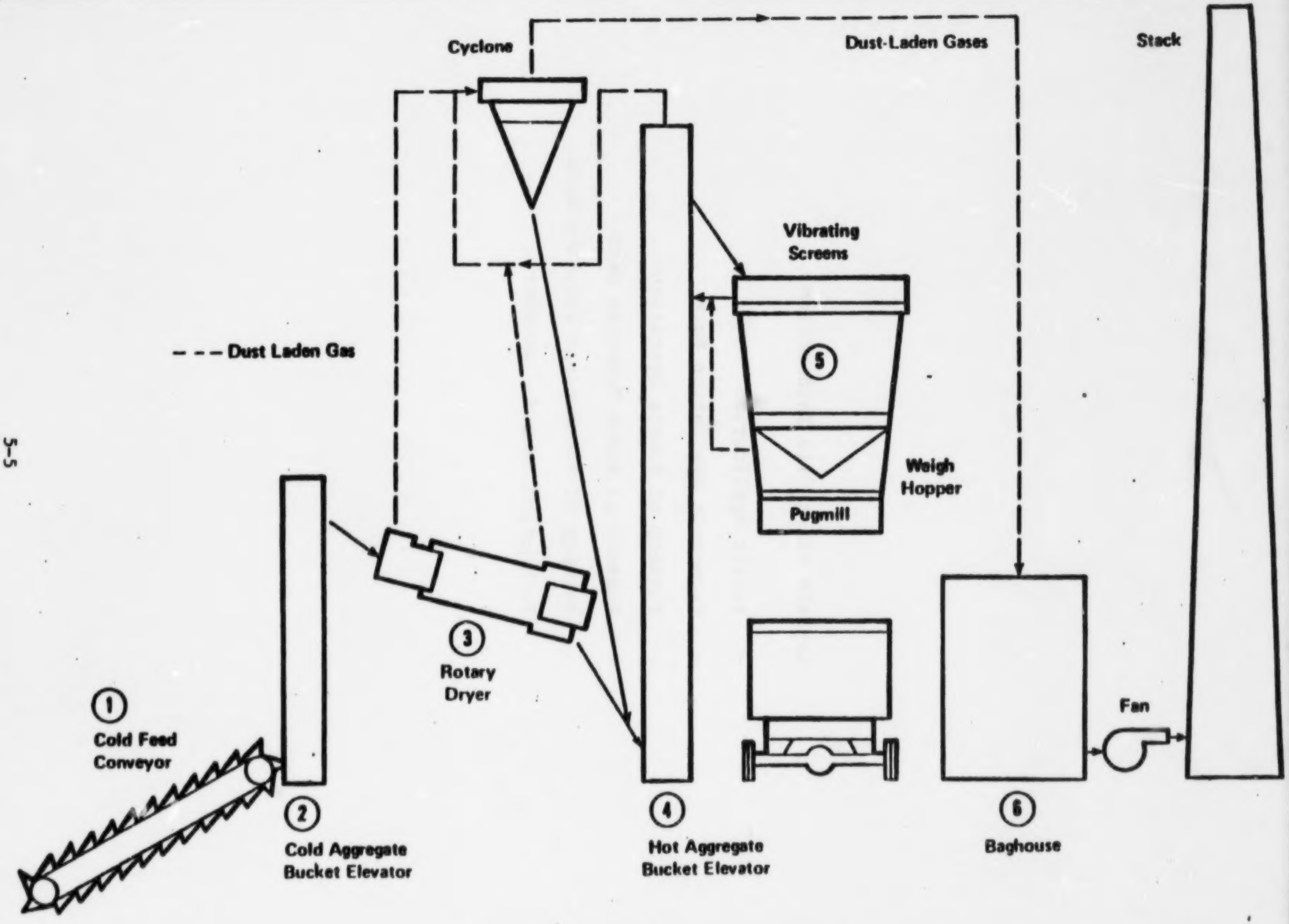
TOTAL NUMBER OF PAGES IN EXHIBIT D: ____________

20. IF THIS IS AN APPLICATION FOR AN OPERATING PERMIT, THE APPLICANT SHALL SUBMIT AN ESTIMATE OF THE MAXIMUM ONE-HOUR AMOUNTS OF PARTICULATE MATTER, SULFUR DIOXIDE, CARBON MONOXIDE, OXIDES OF NITROGEN, AND ORGANIC MATERIAL EMITTED FROM ALL SOURCES LOCATED ON THE PLANT OR PREMISES. THIS ESTIMATE SHALL INCLUDE ALL EMISSION SOURCES LOCATED ON THE APPLICANT'S PREMISES AND NOT JUST THE EMISSION SOURCES DESCRIBED IN THIS APPLICATION.

MATERIAL	MAXIMUM ONE-HOUR AMOUNTS	MATERIAL	MAXIMUM ONE-HOUR AMOUNTS	MATERIAL	MAXIMUM ONE-H AMOUNTS
PARTICULATE MATTER	9.1 LB	SULFUR DIOXIDE	.006 LB	NITROGEN OXIDES	2.
ORGANIC MATERIAL	.03 LB	CARBON MONOXIDE	.17 LB		

21. WHAT IS THE SIZE (IN ACRES) OF APPLICANT'S PREMISES? 50

22. LIST AND IDENTIFY ALL FORMS, EXHIBITS, AND OTHER INFORMATION SUBMITTED AS PART OF THIS APPLICATION. PLEASE NUMBER EVERY PAGE AND STATE THE TOTAL NUMBER OF PAGES IN THIS APPLICATION.


Cyclone
Dust-Laden Gases
Stack
--- Dust Laden Gas
Vibrating Screens
5
Weigh Hopper
Pugmill
1
Cold Feed Conveyor
2
Cold Aggregate Bucket Elevator
3
Rotary Dryer
4
Hot Aggregate Bucket Elevator
6
Baghouse
Fan

Asphalt Plant Inspection Sequence

- **Asphalt Plant File Information**
  - Permit Application
  - Parmetric Evaluation Form
  - Summary of Source Operations
  - Summary of Pitot Traverse Data
  - Summary of Particulate Sampling Data
  - Production Record - October

AUG 26th 1818

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION PROCESS EMISSION SOURCE(A)	FOR AGENCY USE ONLY

1. NAME OF PLANT OWNER: Scenic Valley Asphalt Corp.	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER):
3. STREET ADDRESS OF EMISSION SOURCE: 100 Main Street	4. CITY OF EMISSION SOURCE: Clearview

GENERAL INFORMATION

5. NAME OF PROCESS: Asphalt Paving Material Batching

6. NAME OF EMISSION SOURCE EQUIPMENT: Asphalt Batching

7. EMISSION SOURCE EQUIPMENT MANUFACTURER: Cedar Rapids

8. MODEL NUMBER: H

9. SERIAL NUMBER: C254171

10. FLOW DIAGRAM DESIGNATIONS OF EMISSION SOURCES DESCRIBED ON THIS FORM (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

11. CLEARLY IDENTIFY ANY SIMILAR SOURCES AT THE PLANT OR PREMISES NOT COVERED BY THIS FORM (IF SUCH SOURCES ARE COVERED BY FORMS CONTAINED IN OTHER APPLICATIONS, ALSO IDENTIFY THOSE APPLICATIONS):

12. AVERAGE OPERATION TIME OF EMISSION SOURCE: 10 HRS/DAY 6 DAYS/WK 30 WKS/YR

13. PERCENT OF ANNUAL THROUGHPUT: DEC/FEB 0 % MAR/MAY 15 % JUN/AUG 60 % SEP/NOV 25 %

RAW MATERIAL INFORMATION

14. NAMES OF RAW MATERIALS(B)	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Aggregate - Various sizes depending on mix desired	500,000 LB/HR	237,000 LB/HR
b. Asphalt	30,000 LB/HR	15,000 LB/HR
c.	LB/HR	LB/HR
d.	LB/HR	LB/HR
e.	LB/HR	LB/HR
f.	LB/HR	LB/HR

(A) THIS DATA AND INFORMATION FORM IS TO BE COMPLETED FOR ANY STATIONARY EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE OR AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS ANY FURNACE, BOILER, OR SIMILAR EQUIPMENT USED FOR THE PRIMARY PURPOSE OF PRODUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. FOR SUCH AN EMISSION SOURCE, COMPLETE "DATA AND INFORMATION —FUEL COMBUSTION EMISSION SOURCE," FORM APC-240. AN INCINERATOR IS A COMBUSTION APPARATUS IN WHICH REFUSE IS BURNED. FOR SUCH AN EMISSION SOURCE, COMPLETE "DATA AND INFORMATION — INCINERATOR," FORM APC-250.

(B) COMPOSITIONS OF RAW MATERIALS MUST BE DETAILED TO THE EXTENT NECESSARY TO DETERMINE THE NATURE AND QUANTITY OF POTENTIAL EMISSIONS.

FOR AGENCY USE ONLY

PRODUCT INFORMATION

15. NAMES OF PRODUCTS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Hot-Mix Asphalt Paving Cement	505,000 LB/HR	240,000 LB
b.	LB/HR	LB
c.	LB/HR	LB
d.	LB/HR	LB

WASTE MATERIAL INFORMATION

16. NAMES OF WASTE MATERIALS	MAXIMUM RATE PER IDENTICAL SOURCE	AVERAGE RATE PER IDENTICAL SOURCE
a. Water Vapor	25,000 LB/HR	12,000 LB
b.	LB/HR	LB
c.	LB/HR	LB
d.	LB/HR	

MAXIMUM EMISSIONS FROM EACH IDENTICAL SOURCE*

CONTAMINANT	CONCENTRATION OR EMISSION RATE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
17. PARTICULATE MATTER	a. GR/SCF	b. LB/HR	c.
18. CARBON MONOXIDE	a. PPM (VOL)	b. LB/HR	c.
19. NITROGEN OXIDES	a. PPM (VOL)	b. LB/HR	c.
20. ORGANIC MATERIAL	a. PPM (VOL)	b. LB/HR	c.
21. SULFUR DIOXIDE	a. PPM (VOL)	b. LB/HR	c.
22. OTHER (SPECIFY)	a. PPM (VOL)	b. LB/HR	c.

EXHAUST DATA*

23. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FOR APC-201):		24. GAS FLOW RATE THROUGH EACH EXIT: ACFM	25. EXIT GAS TEMPERATURE:
26. EXIT DIAMETER: FT	27. EXIT HEIGHT ABOVE GRADE: FT	28. MAXIMUM HEIGHT OF NEARBY BUILDINGS: FT	29. EXIT DISTANCE FROM NEA PLANT BOUNDARY:

*NOTE: COMPLETE THESE SECTIONS ONLY IF EMISSIONS ARE EXHAUSTED WITHOUT CONTROL EQUIPMENT.

AUG 26th 1818

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

DATA AND INFORMATION AIR POLLUTION CONTROL EQUIPMENT	FOR AGENCY USE ONLY

1. NAME OF OWNER: Scenic Valley Asphalt Corp.	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER):
3. STREET ADDRESS OF EMISSION SOURCE: 100 Main Street	4. CITY OF EMISSION SOURCE: Clearview

ADSORPTION SYSTEM

1. FLOW DIAGRAM DESIGNATIONS OF ADSORPTION SYSTEMS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. ADSORBANT:

5. NUMBER OF BEDS PER SYSTEM:

6. ADSORBANT WEIGHT PER BED: ______ LB

7. METHOD OF REGENERATION: ☐ REPLACEMENT ☐ STEAM ☐ OTHER (SPECIFY ______)

8. TIME ON LINE BEFORE REGENERATION: ______ MIN/BED

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): ______ %

AFTERBURNER

1. FLOW DIAGRAM DESIGNATIONS OF AFTERBURNERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. FUEL: ☐ GAS ☐ OIL (______ % SULFUR)

5. BURNERS PER AFTERBURNER ______ @ ______ BTU/HR EACH

6. INLET GAS TEMPERATURE: ______ °F

7. OPERATING TEMPERATURE OF COMBUSTION CHAMBER: ______ °F

8. COMBUSTION CHAMBER DIMENSIONS: LENGTH ______ IN; CROSS SECTION ______ IN x ______ IN; OR ______ IN DIA

9. CATALYST USED? ☐ YES ☐ NO

10. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): PARTICULATE ______ % GASEOUS ______ %

FOR AGENCY USE ONLY

CONDENSER

1. FLOW DIAGRAM DESIGNATIONS OF CONDENSERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. TYPE OF COOLANT AND COOLANT FLOW PER CONDENSER:
☐ WATER (________ GPM) ☐ AIR (________ SCFM) ☐ OTHER (TYPE ________ FLOW RATE ________)

5. COOLANT TEMPERATURES: INLET ________ °F OUTLET ________ °F

6. GAS TEMPERATURES: INLET ________ °F OUTLET ________ °F

7. HEAT EXCHANGE AREA PER CONDENSER: ________ FT^2

8. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): ________

CYCLONE Primary Control

1. FLOW DIAGRAM DESIGNATIONS OF CYCLONES OR MULTIPLE CYCLONES DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

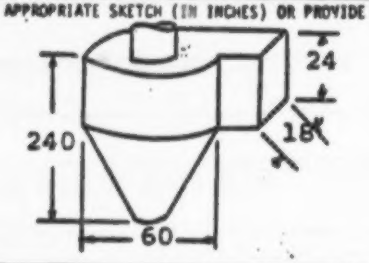
2. MANUFACTURER: Iowa Manufacturing Corp.

3. MODEL NAME AND NUMBER: Single Stage 240H

4. NUMBER OF CYCLONES IN EACH MULTIPLE CYCLONE:

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): AP-42 65 %

6. DIMENSION THE APPROPRIATE SKETCH (IN INCHES) OR PROVIDE A DRAWING WITH EQUIVALENT INFORMATION:



ELECTRICAL PRECIPITATOR

1. FLOW DIAGRAM DESIGNATIONS OF ELECTRICAL PRECIPITATORS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

. MANUFACTURER:

3. MODEL NAME AND NUMBER:

. COLLECTING ELECTRODE AREA PER CONTROL DEVICE: FT^2

5. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN RESULTS): ________

FILTER Secondary Control

. FLOW DIAGRAM DESIGNATIONS OF FILTERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

. MANUFACTURER: Western

3. MODEL NAME AND NUMBER: S1132

. FILTERING AREA PER CONTROL DEVICE: 3200 FT^2

5. FILTERING MATERIAL: Fiber Glass

. CLEANING:
☐ SHAKER ☐ REVERSE AIR ☐ PULSE AIR ☒ PULSE JET ☐ OTHER(SPECIFY ________)

. GAS COOLING:
☐ BLEED-IN AIR(________ SCFM) ☐ WATER SPRAY (________ GPM) ☒ DUCT(LENGTH 70 FT; DIA 36x24 IN) ☐ OTHER(SPECIFY)

. INLET GAS: TEMPERATURE 300 °F; DEW POINT 160 °F

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE): AP-42 99%

FOR AGENCY USE ONLY

SCRUBBER

1. FLOW DIAGRAM DESIGNATIONS OF SCRUBBERS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. MANUFACTURER:

3. MODEL NAME AND NUMBER:

4. SCRUBBER TYPE:

☐ HIGH ENERGY (GAS STREAM PRESSURE DROP ________ IN H_2O)

☐ PACKED (PACKING TYPE ________; PACKING SIZE ________ IN; PACKED HEIGHT ________ IN)

☐ SPRAY (NUMBER OF NOZZLES ________; NOZZLE PRESSURE ________ PSIG)

☐ OTHER (SPECIFY ________ ATTACH DESCRIPTION AND SKETCH WITH DIMENSIONED DETAILS)

5. SCRUBBER GEOMETRY:
LENGTH IN DIRECTION OF GAS FLOW ____ IN; CROSS-SECTION ____ IN X ____ IN OR ____ IN DIA; ☐ CROSS FLOW ☐ COUNTER FLOW

6. LIQUID FLOW RATE INTO SCRUBBER: ________ GPM

7. CHEMICAL COMPOSITION OF SCRUBBANT:

8. INLET GAS TEMPERATURE: ________ °F

9. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
PARTICULATE ________ % GASEOUS ________ %

OTHER TYPES OF CONTROL EQUIPMENT

1. FLOW DIAGRAM DESIGNATION OF CONTROL EQUIPMENT DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. GENERIC NAME OF CONTROL EQUIPMENT:

3. MANUFACTURER:

4. MODEL NAME AND NUMBER:

5. ATTACH DESCRIPTION AND SKETCH OF CONTROL EQUIPMENT WITH DIMENSIONED DETAILS AND FLOW RATES.

6. EFFICIENCY OF CONTROL (ATTACH TEST REPORT OR EXPLAIN ESTIMATE):
PARTICULATE ________ % GASEOUS ________ %

MAXIMUM EMISSIONS FROM EACH IDENTICAL EXIT

CONTAMINANT	CONCENTRATION OR EMISSION RATE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
1. PARTICULATE MATTER	a. GR/SCF	b. 8.0 ☐ LB/10⁶BTU ☒ LB/HR	c. EPA Method - 5
2. CARBON MONOXIDE	a. PPM (VOL)	b. .17 ☐ LB/10⁶BTU ☒ LB/HR	c. Emission Factors for Natural Gas Combustion (AP-42)
3. NITROGEN OXIDES	a. PPM (VOL)	b. 2.0 ☐ LB/10⁶BTU ☒ LB/HR	c. " " " "
4. ORGANIC MATERIAL	a. PPM (VOL)	b. .03 ☐ LB/10⁶BTU ☒ LB/HR	c. " " " "
5. SULFUR DIOXIDE	a. PPM (VOL)	b. .006 ☐ LB/10⁶BTU ☒ LB/HR	c. " " " "
6. OTHER (SPECIFY)	a. PPM (VOL)	b. ☐ LB/10⁶BTU ☐ LB/HR	c.

EXHAUST DATA

1. FLOW DIAGRAM DESIGNATIONS OF EXITS DESCRIBED IN THIS SECTION (REFER TO "GENERAL INSTRUCTIONS FOR COMPLETION OF PERMIT APPLICATIONS," FORM APC-201):

2. GAS FLOW RATE THROUGH EACH EXIT: 28,000 ACFM

3. EXIT GAS TEMPERATURE: 250

4. EXIT DIAMETER: 4' x 2' FT

5. EXIT HEIGHT ABOVE GRADE: 30 FT

6. MAXIMUM HEIGHT OF NEARBY BUILDINGS: 20 FT

7. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: 500

PARAMETRIC EVALUATION FORM

Company Name Scenic Valley Asphalt Location Clearview, Illinois

PARAMETER, (units)	DATE 3/4	DATE 5/28	DATE 9/8	DATE	DATE
1. System Pressure Drop (in. H_2O	3	3	3		
2. Fan Speed (rpm)	450	450	450		
3. Cold Feed Size Gradation:					
Cumulative % by weight passing:					
1 1/2"	100	100	100		
1"	100	100	100		
1/2"	100	100	100		
3/8"	90	92	89		
MESH # 4	70	68	72		
8	55	57	55		
16	43	40	45		
32	35	35	30		
50	20	20	25		
100	15	12	10		
200	7	5	6		

PARAMETRIC EVALUATION FORM

		DATE 3/4	DATE 5/28	DATE 9/8	DATE	DATE
4.	Percent Surface Moisture (%)	4%	6%	5%		
5.	Process Weight Rate (tons per hour)	118	125	120		
6.	Pressure Drop Across Secondary (in. H_2O)	2.5	2.5	2.5		
7.	Water (Injection ☐/ Discharge ☐) Rate, (gpm)	N/A	N/A	N/A		
8.	Pulse Cycle Time (Seconds)	60	60	60		
9.	Secondary Power Input, (Watts)	N/A	N/A	N/A		
	Secondary Current (mA) Secondary Voltage (kV)	N/A	N/A	N/A		
10.	Other (Specify)					

SUMMARY OF SOURCE OPERATION

PLANT: Scenic Valley Asphalt Corp.

LOCATION: 100 Main Street, Clearview, Illinois

DATE OF TEST: July 7, 1977

TYPE OF PROCESS/EQUIPMENT: Permanent Asphalt Plant

Material Processed or Produced: Asphalt paving material

Operating Schedule: 10 Hr./Day 180 Day/Year

Maximum Operating Capacity (Include Units): 252.5 T/hr.

Normal Operating Capacity: 120 T/hr.

Operating Capacity During Test: Test 1 118T; Test 2 130T; Test 3 123T

Fuel Type: Natural Gas % Ash: N/A % Sulfur: N/A

Amount of Fuel Consumed During Test: Not measured.

Pollution Control System Description: Primary cyclone; secondary positive pressure, pulse-cleaned baghouse with dust return to fines storage bin.

Pressure Drop Across Collector: 6" W.C.

Additional Information:

SUMMARY OF PITOT TRAVERSE DATA

SHEET 1 of

PLANT: Scenic Valley Asphalt Corp. SOURCE: Baghouse Stack DATE: 7/7/7

A.	Stack Dimensions	2' x 4'
B.	Area of Stack, Sq. Ft.	8
C.	Barometric Pressure, "Hg	29.65
D.	Gage Static Pressure in Stack, "H_2O	0.18"
E.	Stack Gas Temperature, Dry Bulb, ^{o}F	280
F.	Percent Moisture	10%
G.	Dry Gas Composition: %O_2	17.1
	%CO_2	2.1
	%CO	< 0.1
	%N_2	80.8
	% other ____________	-
H.	Density of Dry Stack Gas, @ STP, Lbs./Cu. Ft.	0.08
I.	Density of Moist Stack Gas, @ STP, Lbs./Cu. Ft.	0.07
J.	Density of Moist Stack Gas, @ Stack Conditions, Lbs./Cu. Ft.	0.054
K.	Total Number of Traverse Points	12
L.	Pitot Tube Calibration Factor	0.82
M.	Average Square Root Velocity Head of all Traverse Points	0.77
N.	Average Gas Velocity, Feet/Min.	3500
O.	Stack Gas Flow Rate:	
	1. @ Stack Conditions, Wet, ACFM	28,200
	2. @ Standard Conditions, Wet, SCFM	20,300
	3. @ Standard Conditions, Dry, DSCFM	18,250

STP = $70^{o}F$, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

SUMMARY OF PARTICULATE SAMPLING DATA SHEET 1 of 2

PLANT: Scenic Valley Asphalt Corp. SOURCE: Baghouse Outlet DATE: 7/7/77

A.	Sample Number	1	2	3	
B.	Number of Points Sampled	12	12	12	
C.	Total Duration of Sample, Min.	60	60	60	
D.	Nozzle Diameter, In.	.260	.260	.260	
E.	Nozzle Area, Sq. Ft.	.000369	.000369	.000369	
F.	Calibration Factors				
	1. Probe Pitot Tube	.82	.82	.82	
	2. Gas Meter H@ =	2.07	2.07	2.07	
G.	Barometric Pressure, "Hg.	29.80	29.80	29.80	
H.	Gage Static Pressure in Stack, "H_2O	.18	.18	.18	
I.	Stack Gas Temperature, °F (Ave)	270	280	290	
J.	Average Square Root Velocity Head of Points Sampled	.76	.77	.78	
K.	Average Gas Meter Temperature, °F	88.2	91.8	89.6	
L.	Average Gas Meter Pressure, "H_2O	.716	.743	.785	
M.	Gas Meter Volume, Actual, Cu. Ft.	44.80	45.74	47.09	
N.	Gas Meter Volume, @ STP, Cu. Ft.	44.00	45.04	46.57	
O.	Liquid Volume of Water Condensed, ML.	102.1	105.6	108.3	
P.	Vapor Volume of Water Condensed at STP, Cu. Ft.	4.77	5.06	5.23	
Q.	Total Gas Sampled Through Nozzle, @ STP, Cu. Ft.	48.75	50.10	51.80	
R.	Percent Moisture in Stack	9.8	10.1	10.1	

SUMMARY OF PARTICULATE SAMPLING DATA SHEET 2 of 2

S. Particulate Concentration				
1. Grains/Dry Standard Cubic Feet	.05	.04	.05	
2. Lbs./Hr.	8.0	6.3	8.0	
T. Percent Isokinetic	105.6	108.6	107.9	

STP = 70°F, 29.92 "Hg.

"Wet" or "Moist" - Refers to the condition of the gas with actual water content.

SCENIC VALLEY ASPHALT

PRODUCTION RECORD FOR Oct. '77
(tons per day)

Type of Mix*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SVA Mix 1	—	—	100	—	80	—	—								
SVA Mix 2	800	950	850	900	875	775	800								
SVA Mix 3	300	250	225	125	275	325	425								
TOTALS	1100	1200	1175	1025	1230	1100	1225								

Type of Mix*	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
SVA Mix 1															
SVA Mix 2															
SVA Mix 3															
TOTALS															

* COMPILATION OF MIXES

Type of Mix	Aggregate By Size in Mix, %									
	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
Mix 1	100	75-100	60-80	35-55	20-35	-	10-22	6-16	4-12	2-8
Mix 2	-	100	85-100	65-80	50-65	37-52	25-40	18-30	10-20	3-10
Mix 3	-	-	100	85-100	80-95	70-89	55-80	30-60	10-35	4-14

SVA Mix 1 = Asphalt Institute Grade III
SVA Mix 2 = Asphalt Institute Grade V
SVA Mix 3 = Asphalt Institute Grade VII

STUDENT EXERCISE NO. 6

INSPECTION OF COMBUSTION SOURCES

LECTURE AND FILM

United States
Environmental Protection Agency
Contract No. 68-02-1315
Applied Science Associates, Inc.
Box 158 Valencia, Pennsylvania 16059

INSPECTION OF COMBUSTION SOURCES
a training module
for fuel burning equipment inspectors

● TRAINEE'S WORKBOOK

Zita Glasgow, Project Manager
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Valencia, Pennsylvania 16059
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Prepared for the
United States Environmental Protection Agency
Control Programs Development Division
Air Pollution Training Institute
Research Triangle Park, North Carolina 27711
March 1974

6-12

US|EPA

This is not an official policy and standards document.
The opinions, findings, and conclusions are those of the authors
and not necessarily those of the Environmental Protection Agency.
Every attempt has been made to represent the present state of the art
as well as subject areas still under evaluation.
Any mention of products or organizations does not constitute endorsement
by the United States Environmental Protection Agency.

ACKNOWLEDGEMENTS

The project reported in this volume was developed under a contract from the Environmental Protection Agency, Contract No. 68-02-1315. Mr. George Purifoy, Program Scientist, served as principal investigator. Ms. Zita Glasgow, Staff Scientist, served as project director. Mr. Joseph Cherico of the Allegheny County Health Department's Bureau of Air Pollution Control, and Mr. Richard W. Gerstle, Vice President of PEDCO-Environmental Specialists, Inc., served as technical consultants.

The author is indebted to numerous people for their cooperation and participation in the project. Silvermine-Films, Inc. provided the film making expertise for the project. Mr. Joseph Cherico played the role of the Field Enforcement Officer in the film and assisted in obtaining permission from industries to film at their facilities. The roles of the plant Representatives were played by Mr. D. E. Kordes, Mr. G. Edward Scutt, and Mr. Al Taylor. The New Jersey State Bureau of Air Pollution Control and the Pennsylvania Bureau of Air Quality and Noise Control assisted in the field test of this material.

EPA

AIR POLLUTION TRAINING INSTITUTE
MANPOWER AND TECHNICAL INFORMATION BRANCH
CONTROL PROGRAMS DEVELOPMENT DIVISION
OFFICE OF AIR QUALITY PLANNING AND STANDARDS

The Air Pollution Training Institute (1) conducts training for personnel working on the development and improvement of state, and local governmental, and EPA air pollution control programs, as well as for personnel in industry and academic institutions; (2) provides consultation and other training assistance to governmental agencies, educational institutions, industrial organizations, and others engaged in air pollution training activities; and (3) promotes the development and improvement of air pollution training programs in educational institutions and state, regional, and local governmental air pollution control agencies. Much of the program is now conducted by an on-site contractor, Northrop Services, Inc.

One of the principal mechanisms utilized to meet the Institute's goals is the intensive short term technical training course. A full-time professional staff is responsible for the design, development, and presentation of these courses. In addition the services of scientists, engineers, and specialists from other EPA programs, governmental agencies, industries, and universities are used to augment and reinforce the Institute staff in the development and presentation of technical material.

Individual course objectives and desired learning outcomes are delineated to meet specific program needs through training. Subject matter areas covered include air pollution source studies, atmospheric dispersion, and air quality management. These courses are presented in the Institute's resident classrooms and laboratories and at various field locations.

Robert G. Wilder
Program Manager
Northrop Services, Inc.

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TABLE OF CONTENTS

Page

OVERVIEW OF THE COURSE 1

CHAPTER 1. ELEMENTS NECESSARY FOR GOOD COMBUSTION . 3

Introduction 3
The Composition of Fuels 3
Air Supply for Combustion 4
Elements of a Good Combustion System 7
Definitions of Some Components in the Combustion System and Their Functions 9

CHAPTER 2. OPERATION OF EQUIPMENT TO BE INSPECTED . 11

Introduction 11
The Spreader Stoker 11
Pulverized Fuel Firing Units 15
Cyclone Furnace 18
Oil Burning Furnaces 22
Air Pollution Control Equipment 26

SELF-EVALUATION QUESTIONNAIRE I 30

CHAPTER 3. INSPECTION POINTS AND OBSERVATIONS WHICH SHOULD BE MADE 35

Introduction 35
Observe Plume Before Entering the Plant 36
Inspect Fuel Preparation System 36
Inspect Furnace Interior 38
Inspect Control Panel Instrumentation 39
Inspect Fans and Duct Work 46
Inspect Ash Disposal Systems 46
Inspect Air Pollution Control Systems 46

SELF-EVALUATION QUESTIONNAIRE II 48

CHAPTER 4. SOURCES INSPECTED IN THE FILM 51

Introduction 51
Your Job While Viewing the Film 51
Information About the Sources to be Inspected in the Film 53

REFERENCES 78

LIST OF TABLES

Table		Page
1.1	BTU Values When the Three Important Combustibles in Fuel Unite With Oxygen at the Combustion Temperature	5
2.1	National Bureau of Standards Grades for Fuel Oil . .	23
3.1	Plume Characteristics and Operating Parameters . . .	37
3.2	Guides for CO_2 Concentration in Flue Gas Leaving Furnace	42
3.3	Guides for O_2 Levels in Combustion	42

LIST OF FIGURES

Figure		Page
1.1	Diagram of the basic elements of a combustion system	8
2.1	Traveling grate Spreader Stoker with front ash discharge	12
2.2	Spreader Stoker installation with gravity fly-ash return	13
2.3	Circular burners for firing pulverized coal	16
2.4	Direct-firing system for pulverized coal	17
2.5	Cyclone Furnace operation	19
2.6	Bin, direct-firing, and direct-firing pre-drying bypass systems for coal preparation and feeding to the Cyclone Furnace (schematic)	20
2.7	Firing arrangements used with Cyclone Furnaces . . .	21
2.8	Circular register burner for oil burning	25
2.9	Cell burner for pulverized coal, oil and natural gas firing	25
2.10	Air pollution control equipment	27
3.1	Opacity chart	41
3.2	Opacity chart	41
3.3	Steam-flow/air-flow pens calibrated to coincide . .	43
3.4	Steam-flow/air-flow pens modified to show parallel traces	43
3.5	CO_2 concentration recorded continuously	45
3.6	Pressure drop gauge	45
4.1	The control room	56
4.2	CO_2 concentration	56

(Continued, next page)

LIST OF FIGURES (cont.)

Figure Page

4.3 Condition of steam-flow/air-flow 57

4.4 Emissions as shown by opacity chart 57

4.5 Slag deposits on furnace walls 58

4.6 Readings on "bus section" of electrostatic precipitator 58

4.7 Fan and duct work 59

4.8 Equipment associated with the forced air fan system 59

4.9 Ash dumped into truck for disposal 59

4.10 The system for coal delivery 60

4.11 Fuel bed and flame 65

4.12 A portion of the Spreader Stoker grate 65

4.13 Slag deposits on furnace walls 66

4.14 The coal delivery system 67

4.15 The doors to the basement ash pit 67

4.16 The opacity chart 68

4.17 The steam-flow/air-flow chart 68

4.18 Percent of oxygen in combustion air 69

4.19 Pressure drop gauge for air pollution control cyclones 69

4.20 The oxygen recorder, the opacity recorder and the steam-flow/air-flow recorder 74

4.21 Gauges showing conditions of the fuel delivery system 75

4.22 Fans and duct work 76

4.23 Firebox interior 77

OVERVIEW OF THE COURSE

This course is intended for personnel in air pollution control agencies who are responsible for inspecting fuel-burning equipment. Fuel-burning equipment, as treated in this course, consists of equipment designed to burn fossil fuels in order to generate heat. The heat generated is then used in various thermal processes such as steam generation and electric power generation. At the end of this course you will be able to distinguish between good operating practices which will result in reduced air pollution and poor operating practices which may result in an increase in air pollution.

The course has two interdependent components--the Workbook and a Film. The Workbook contains information about the:

Elements necessary for good combustion (Chapter 1).

Operation of equipment to be inspected (Chapter 2).

Inspection points and observations which should be made (Chapter 3).

Sources inspected in the film (Chapter 4).

The Film shows the inspection process as it would actually be carried out by an experienced Field Enforcement Officer (FEO). As you view the Film you will make the same visual inspection points as the FEO in the Film. You will see what he sees and then for some points decide whether or not satisfactory or unsatisfactory operating practices are evident. The Film is divided into three parts:

Part I:	Inspecting a plant which has a pulverized coal burner. This part of the film contains a sequence about the Cyclone Furnace.
Part II:	Inspecting a plant which has a spreader stoker furnace.
Part III:	Inspecting a plant which has an oil burner for residual or distillate oils.

CHAPTER 1. ELEMENTS NECESSARY FOR GOOD COMBUSTION

Introduction

Combustion is the chemical combination of oxygen with the combustible elements of a fuel. It can take place rapidly, as for example in a fireplace or a boiler furnace. Or it can take place very slowly, taking years in the process. A discussion of combustion which takes place over a long period of time may be helpful in understanding what goes on during the process. Vegetation, left to rot, will after a while disappear because it will have gone through the process of decay. During this process, a chemical action takes place. The matter which forms the waste is oxidized. In other words, it forms various compounds which pass away mostly in the form of gases. During this process some heat is given off, but because the process is so slow, it goes unnoticed. Assume this heat is given off in a confined space where the gases cannot escape, as for example with hay in a barn. The increase in temperature might cause an increase in the temperature of the hay, until perhaps the gases given off ignite and the hay and barn catches fire. Essentially the same process occurs in large combustion systems, such as boiler plants. The combustion system feeds fuel which mixes with air and ignites when the temperature is high enough. The fuel then burns at rates necessary to generate the amount of thermal energy needed.

The Composition of Fuels

There are just three combustible chemical elements of significance--carbon, hydrogen, and sulfur. The most important combustible in all fuels is carbon. Carbon is present in fuels in varying quantities. Coal, coke, and oil are valuable and useful as fuel because of their high carbon content.

Next to carbon, hydrogen, a gas, is the most important constituent of fuels and plays an important part in the combustion process. It is

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found in small quantities in most fuels, but it is important because of the high heat output from its combustion.

Sulfur is present in most fuels in small quantities. Sulfur is usually of minor significance as a source of heat, but it can be of major significance in pollution problems.

Air Supply for Combustion

Oxygen necessary for combustion is found in air. Air is composed of largely two gases, oxygen and nitrogen. There is approximately four times the volume of nitrogen to that of oxygen. Nitrogen is an inert gas and has no direct value as an aid to combustion, but it is a source of pollution. At extremely high temperatures the nitrogen molecules and the atmospheric oxygen molecules combine to form oxides of nitrogen (NO_x). NO_x emissions from large plants may produce a brownish haze or cloud in the vicinity of the plant.

When oxygen unites with the carbon in a fuel, two important gases result from this chemical action. One is carbon monoxide (CO) and the other is carbon dioxide (CO_2). If sufficient air is at hand when this chemical action takes place then CO_2 is formed. If there is an insufficient supply of air, CO is formed. The heat output from CO_2 is nearly three and one half times greater than that from CO. It is obvious that to obtain the greatest heat output when carbon is going through the combustion process, a sufficient supply of air must be available. Hydrogen, the next most important combustible, unites with oxygen and forms water vapor or steam (H_2O).

The heat value of sulfur is small but the oxidation of sulfur forms sulfur oxides (SO_x). Sulfur oxides are produced in significant quantity by the combustion of most coals and fuel-oils and are a serious cause of pollution. Sulfur oxides can be controlled by using low sulfur fuels in the combustion process.

In the combustion process, the uniting of carbon, hydrogen, and sulfur can take place only at what is known as "the temperature of combustion" or the "ignition temperature". This temperature varies with each constituent of any given fuel. Ignition temperature is the temperature which must be attained or exceeded in the presence of oxygen to cause combustion. The important point is that combustion cannot take place completely below this temperature.

The heat of combustion is measured as the quantity of heat evolved by burning a standard unit of fuel (BTU/kilogram for coal and BTU/liter for oil). Heat contents of fuel differ because of variations in percentages of carbon, hydrogen, and sulfur. Table 1.1 shows the heat produced for 1 kilogram (kg) of carbon, 1 kg of hydrogen, and 1 kg of sulfur.

Table 1.1 BTU Values When the Three Important Combustibles in Fuel Unite with Oxygen at the Combustion Temperature

1 kg carbon (complete combustion forming CO_2)	= 32,288 BTU
1 kg carbon (incomplete combustion forming CO)	= 14,207 BTU
1 kg hydrogen	= 136,868 BTU
1 kg sulfur	= 8,882 BTU

Source: Cotton, J. C. Combustion and modern coal-burning equipment. London: Pitman & Sons, 1946.

As we said earlier, the oxygen required for combustion is largely drawn from the air supply. However, oxygen is only one of several gases in air. It contains 23.2 percent of oxygen by weight. About 2-2/3 kg of oxygen are needed to complete the combustion of 1 kg of carbon, while 8 kg of oxygen are required to completely burn 1 kg of hydrogen. It is obvious that a great deal of air is needed in order to provide the required amount of oxygen for combustion.

For complete combustion to take place, it is necessary that each particle of the substance being burned be in intimate contact with the oxygen. With solid fuels this is a problem because of the small surface of the fuel exposed to the air.

If sufficient air reaches the combustion chamber and the firebed and is intimately mixed with the fuel, complete combustion will take place. If the air supply is in any way restricted in quantity then there will be incomplete combustion. Unburned particles of carbon in the form of hydrocarbons will pass out through the stack as visible emissions. There will also be a considerable waste in heat generated due to the formation of CO instead of CO_2.

In order to ensure that sufficient air has reached the combustion chamber, several types of combustion air are of interest. Primary air is air which is introduced with the fuel at the burner or over the fuel bed. Secondary air is introduced through specifically arranged inlets.

In order to ensure that sufficient air reaches the combustion chamber, it is usual to supply air in quantity in excess of what is theoretically required. The actual amount of excess air necessary varies with each installation.

Increasing the excess air decreases the amount of unburned combustible matter and increases the combustion efficiency. At the same time excess air dilutes and cools the combustion gases. Each kilogram of excess air introduced into the chamber absorbs useful heat. Because excess air is a factor in the emission of all air contaminants optimum excess air requirements should be established for each installation.

In summary, there are three main requirements for complete combustion. They are:

1. Air from which the correct amount of oxygen can be drawn.
2. An intimate mixture of fuel and air.
3. A sufficient temperature at the point where combustion is taking place.

It can be seen that efficient combustion can take place only under certain conditions.

Elements of a Good Combustion System

A combustion system feeds fuel, intimately mixes the fuel with air and ignites and burns the fuel in a firebox at rates necessary to generate the amount of thermal energy required. Figure 1.1 presents a diagram of a simplified combustion system. The fuel may consist of liquids, solids or gases. The combustion systems discussed in this course use coal and oil. In some systems the fuel cannot be used in the same condition it is when it arrives at the plant. For example, some liquid fuels have to be preheated before they can be used in combustion. Solid fuels may have to be crushed, ground, classified, washed or otherwise conditioned before combustion. The fuel must also be mixed with air in the proper ratio in order to provide for complete combustion. Depending on the type of equipment, the air-fuel mix may occur prior to feeding the fuel into the firebox, as the fuel is fed into the firebox or in the firebox itself. Whichever process is used, sufficient turbulence must be permitted to allow thorough mixing of fuel particles with combustion air.

During this combustion process a definite amount of heat is given out and this heat is used, in the case of a boiler, to heat the water which surrounds the combustion chamber. In all solid fuels there is a residue which is unburnable, and it is therefore a useless part of the fuel known as ash. Ash remains as a waste product after combustion and is periodically or continuously removed from the firebox for disposal. The gaseous products of combustion and any light pieces of fly ash entrained in the gases are carried out the stack. The draft which draws the products of combustion into the flue may be natural or mechanical. In large operations fans are used. To meet the objective of a clear stack, some form of particulate removal equipment is used to remove the fly ash from the flue gases. In some cases, devices called scrubbers which also control sulfur oxides (SO_x) are used.

The entire combustion system is typically monitored from a control board. The conditions which show up on the control panel vary from plant to plant. Control panel instrumentation is discussed later in this Workbook.

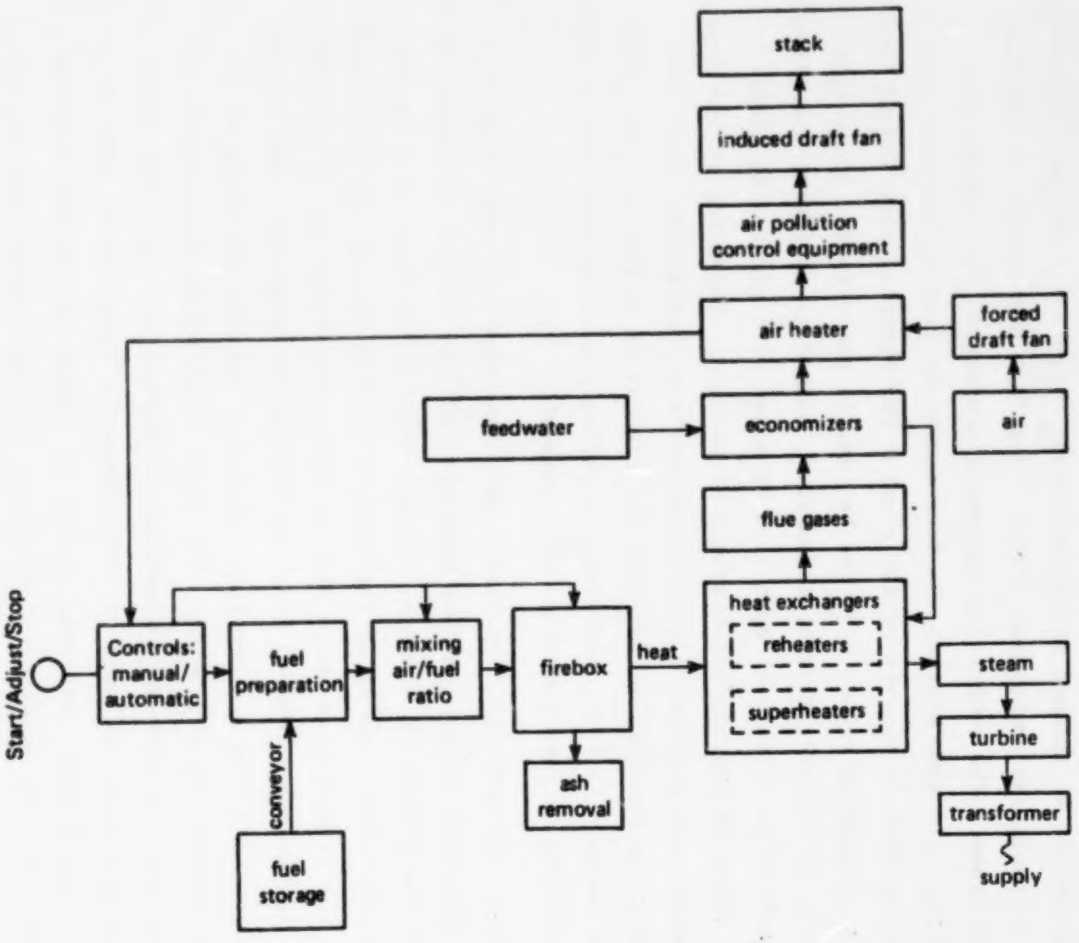
stack
induced draft fan
air pollution control equipment
air heater
forced draft fan
air
feedwater
economizers
flue gases
heat exchangers
reheaters
superheaters
steam
turbine
transformer
supply
Start/Adjust/Stop
Controls: manual/ automatic
fuel preparation
conveyor
fuel storage
mixing air/fuel ratio
firebox
heat
ash removal

Figure 1.1 Diagram of the basic elements of a combustion system.

Definitions of Some Components in the Combustion System and Their Functions

AIR HEATERS: Air heaters reclaim some heat from the flue gases to heat the air required for fuel combustion.

BOILERS: Shells, drums or tubes which contact hot gases on one side and water on the other. Heat is transferred from the hot gases through the boiler walls to the water on the other side.

ECONOMIZER: In large units, the economizer absorbs heat from the flue gases. The heat is in turn used to heat the feedwater before the water enters the boiler. Economizers allow for economic use of the heat generated from fuels and thus warrant their name.

FANS: Move air or gas through the combustion system. The fan usually consists of a bladed rotor or impeller and a housing. The draft created by the fan may be either forced or induced. Forced draft fans "push" air and induced draft fans "pull" air.

FEEDWATER: Water supplied to the heat exchanger units for heating or steam production.

FURNACE: Firebox where combustion takes place. Usually of refractory cement, water tube or firebrick construction. Furnaces are rated in terms of million BTU/hour of capacity, or when combined with a boiler, in kilograms of steam generated/hour, or boiler horsepower. Since the furnace and boiler are usually built as an integrated unit, no sharp distinction is usually made.

REHEATERS AND SUPERHEATERS: Heat steam to higher temperatures to effect higher thermodynamic gain and improve turbine efficiency. Units are essentially banks of tubes exposed to the hot gas stream.

SOOT BLOWERS: Jets of high pressure steam or air which are blown across the surfaces of the furnace to remove soot deposits. Soot blowing schedules vary depending upon the fuel burned and the size of the operation. Frequencies of soot blowing varies from every 2 hours to every 24 hours.

CHAPTER 2. OPERATION OF EQUIPMENT TO BE INSPECTED

Introduction

This chapter describes systems for coal and oil burning and air pollution control equipment associated with these systems. You will read about the spreader stoker system of firing coal, about the systems which burn coal in pulverized form, and the Cyclone Furnace firing of coal. You will also read about equipment which burns residual and distillate oils. Air pollution control equipment covered in this chapter include electrostatic precipitators, inertial separators and wet scrubbers.

The Spreader Stoker

Mechanical stokers were developed early in the history of the steam boiler as an improvement over hand firing. Today several types of stokers are available. Among these several types, the spreader stoker is the most generally used in the capacity from 34,000 to 181,000 kilograms (75,000 to 400,000 pounds) of steam per hour. It responds rapidly to load swings and can burn a wide range of fuels with low maintenance, high daily efficiency and simplicity of operation.

As the name implies, the spreader stoker projects coal into the furnace over the fire with a uniform spreading action. Fine fuel particles are burned in suspension, and the larger pieces fall and burn on a grate. Figure 2.1 illustrates this method of firing.

The spreader stoker combines suspension and fuel bed firing. The coal is fed from the hopper onto a rotating flipper mechanism, which throws the fuel into the furnace. The modern spreader stoker installation consists of a coal hopper, a feeder distributor unit that regulates the flow of coal in proportion to the load, and a distributor rotor that throws the coal into the furnace and distributes it on the grate. The grate is specifically designed to meter the flow of air into the furnace. Air ports cast in the grate provide uniform air flow to the entire active

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grate, and forced draft fans provide both undergrate (primary) air and overfire (secondary) air. The fuel introduced into the furnace ignites rapidly, starting to release hydrocarbons the instant the fuel enters the high temperature zone. Because partial suspension burning results in a great carry-over of particulate matter in the flue gas, dust collectors are frequently required. Large coarse particles in these dust collectors may be skimmed off and reinjected into the furnace for further burning. The overfire-air may be adapted to return fly carbon to the high temperature zone just above the fuel bed. Figure 2.2 shows a spreader stoker installation with a gravity fly-ash return.

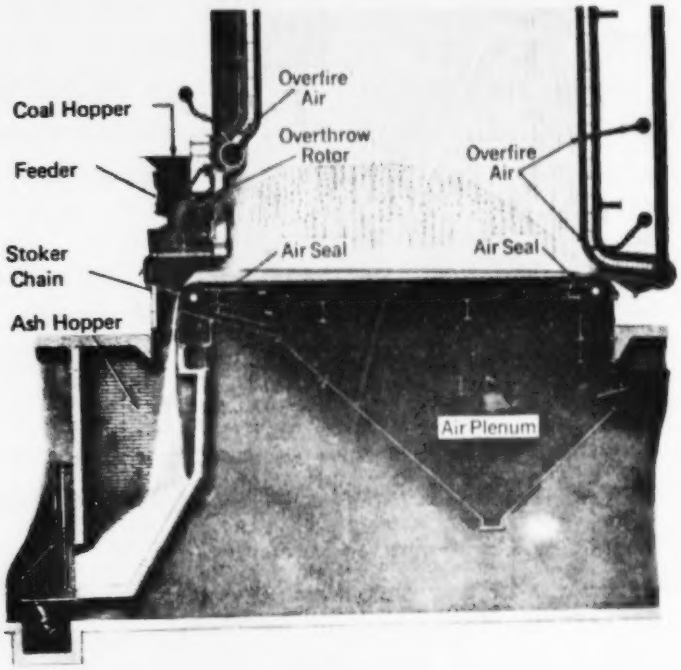

Coal Hopper
Overfire Air
Overthrow Rotor
Feeder
Overfire Air
Stoker Chain
Air Seal
Air Seal
Ash Hopper
Air Plenum

Figure 2.1 Traveling-grate Spreader Stoker with front ash discharge.[5]

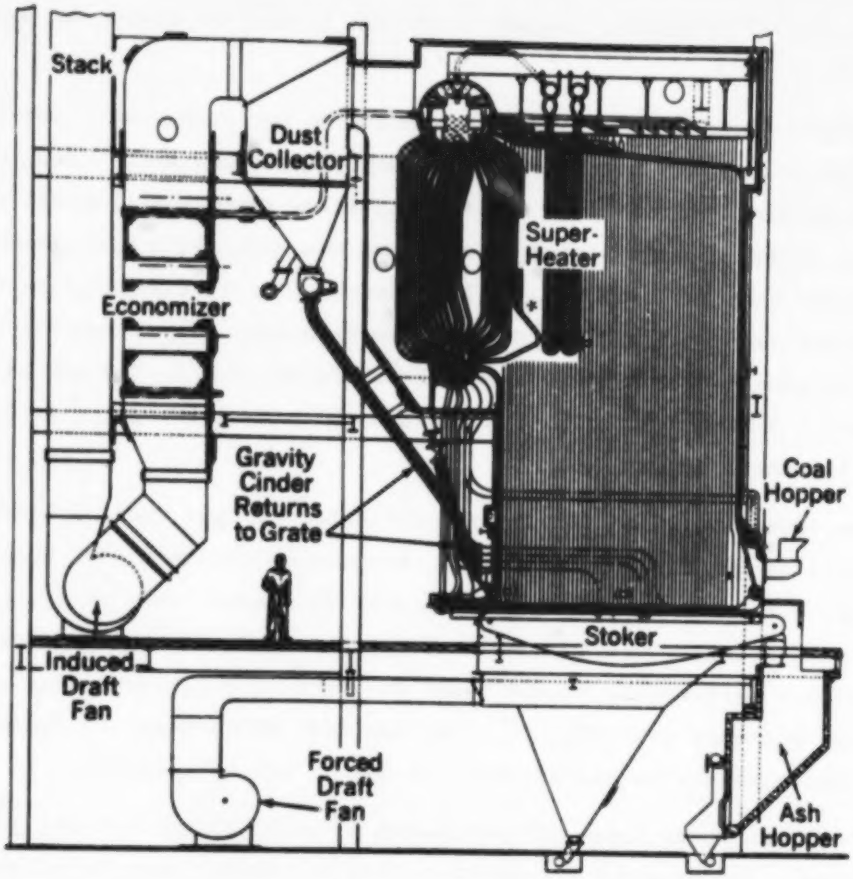

Stack
Dust Collector
Economizer
Super-Heater
Gravity Cinder Returns to Grate
Coal Hopper
Stoker
Induced Draft Fan
Forced Draft Fan
Ash Hopper

Figure 2.2 Spreader Stoker installation with gravity fly-ash return.[5]

TYPES OF SPREADERS

There are various types of spreader stokers. The main difference among them is in the grate design and operation. The stoker grates may be of the stationary, dumping, and continuous discharge type.

With stationary grates, the ash is removed manually by a hoe or rake through doors at the grate level. This limits application to boilers of 9,000 to 13,690 kilograms (20,000 to 30,000 pounds) of steam per hour capacity.

Dumping-grate designs have grate sections for each feeder and the undergrate air plenum chambers are correspondingly divided. These models are constructed in individual sections to allow temporary shut-off of fuel from the feeder mechanism, and of air from the undergrate air plenum chambers on the particular section to be cleaned. The remaining grate section or sections can remain in operation. The frequency of ash removal depends on the burning rate and the percent of ash in the fuel. The ash is deposited into a basement ash pit or a shallow ash pit if the grate is 3.65 meters (12 feet) or less.

The advantage of continuous ash discharge is that there are no interruptions for ash removal. Also, because of the thin fast burning fuel bed, burning rates are approximately 70% greater than with stationary and dumping grates. Continuous discharge grates may be as large as 48.77 square meters (525 square feet) of grate, and corresponding to steam capacity, somewhat over 181,000 kilograms (400,000 pounds) of steam per hour. Above this size the spreader stoker is not effective.

There are three types of continuous cleaning grate stokers, namely, continuously reciprocating, intermittently vibrating, and traveling grate. The reciprocating grate consists of alternate rows of continuously reciprocating grates imparting a forward movement of the ash for automatic discharge at the front or feeder end of the stoker. The vibrating grate stoker has a vibration generator on the grate frame. It is periodically energized to remove the accumulated ash to the ash pit. The traveling grate stoker consists of an endless chain of grates slowly moving through the furnace permitting the ash to reach a depth of several centimeters (inches) before being automatically discharged into the ash pit. The depth of ash accumulating on the grate can be controlled by speeding up or slowing down the rate at which the grate travels.

The grate types described above can be placed in two categories, agitating and non-agitating. The agitating types are the reciprocating and vibrating. The non-agitating are the stationary, intermittent dumping, and the continuously traveling grate.

FUELS AND FUEL BED

As we stated earlier, an outstanding characteristic of the spreader stoker is its ability to burn a wide range of fuels. Except for anthracite, it can handle everything from semianthracite to lignite. Even though the spreader stoker can burn a wide variety of coals, fuel sizing is critical to good operation. Ideally the coal should range in size from 1.90 centimeters (3/4 inches) or less to about 5 centimeters (2 inches). If the coal is too coarse, the large lumps will not be completely oxidized on the grate. As a result clinkers will tend to form in the areas containing the large sizes. If there are too many fines in the coal, the fly ash carry-over will be excessive creating an increase in emissions from the stack.

The ideal fuel and ash bed for the coal-fired spreader stoker is evenly distributed and from 5 to 10 centimeters (2 to 4 inches) thick. There should be an absence of clinkers in the bed so that there is a uniform air flow through all portions of the grate. The ash discharged into the ash pit should be about popcorn size. Any ash as large as a man's fist is too large.

Pulverized Fuel Firing Units

In this system, coal is pulverized to particles, at least 70 percent of which pass through a 200-mesh sieve and is fired in burners similar to those used for liquid fuel. The pulverized coal method permits continuous use of raw coal directly from bunkers where it is stored in the condition received at the plant. Any size coal may be used. Raw coal is dried and pulverized simultaneously in a mill and is fed to the burners as required by the furnace load. A small portion of the air required for combustion (15% to 20%) is used to transport coal to the burner. This is known as primary air. A predetermined air-coal ratio is maintained for any given load. Secondary air, the remainder of the combustion air (80% to 85%) is introduced at the burner. (See Figure 2.3) The pulverized coal ejected into the furnace then burns in suspension.

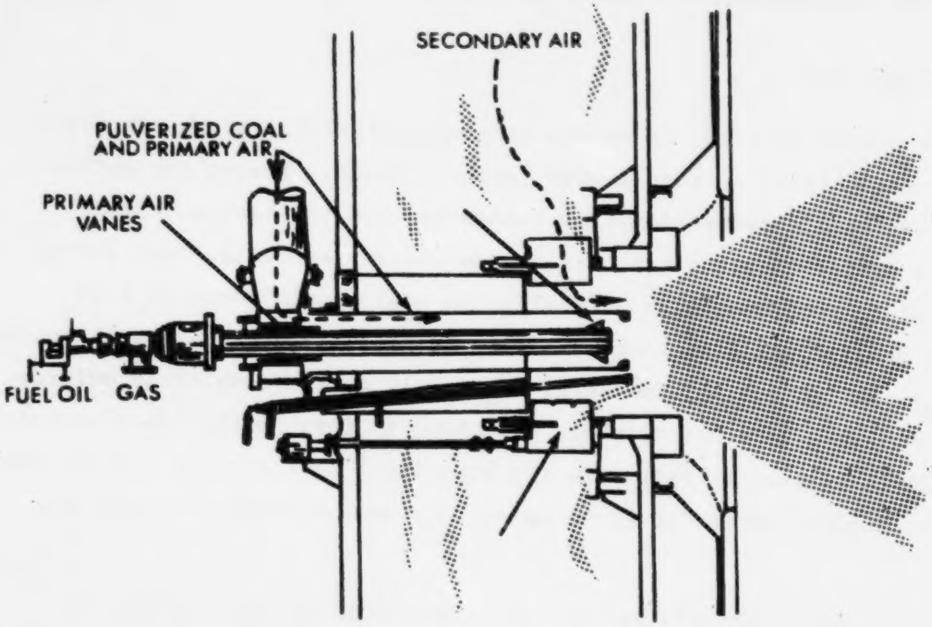


Figure 2.3 Circular burners for firing pulverized coal[6]

There are two basic systems of pulverized fuel preparation and firing, the bin system and the direct-firing system. The direct-firing system is the one being installed almost exclusively today.

The basic equipment components of a direct-firing pulverized coal system are the pulverizer and the burner. The pulverizer grinds the coal to the fineness required. The burner accomplishes the mixing of pulverized coal and primary air with secondary air in the right proportion and delivers the mixture to the furnace for suspension burning. Other necessary components are the raw-coal feeder which controls the rate of coal fed to each pulverizer; the primary air fan which supplies air for drying and conveying the coal-air mixture to the burner; and the coal and air conveying lines. Figure 2.4 illustrates these components and their relationship. Completeness of combustion is a function of the uniform distribution of fuel and air, turbulence imparted to the fuel and air mixture, type of firing used, and the fineness of pulverization.

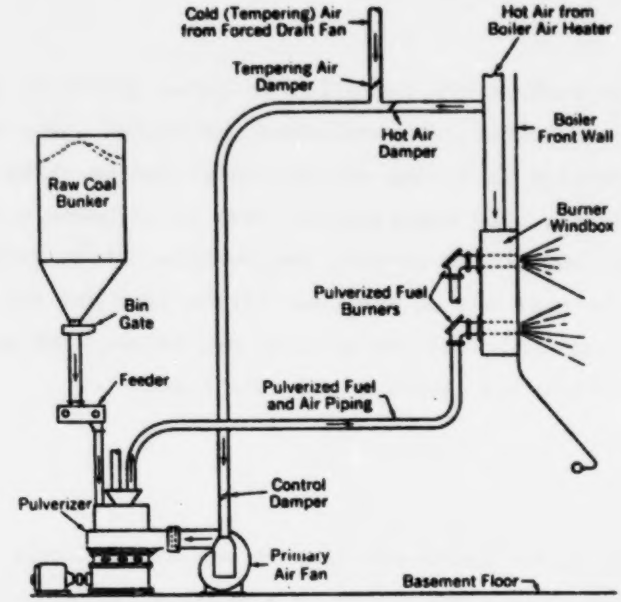

Cold (Tempering) Air from Forced Draft Fan
Hot Air from Boiler Air Heater
Tempering Air Damper
Boiler Front Wall
Hot Air Damper
Raw Coal Bunker
Burner Windbox
Pulverized Fuel Burners
Bin Gate
Feeder
Pulverized Fuel and Air Piping
Control Damper
Pulverizer
Primary Air Fan
Basement Floor

Figure 2.4 Direct-firing system for pulverized coal[5]

PRIMARY AIR SYSTEM

The rate of fuel feed in the direct-firing method is automatically controlled by the boiler load demand. Air flow to the pulverizer is proportioned to fuel rate to provide the air for drying the coal. In order to pulverize and circulate fuel pneumatically within a pulverizer, some moisture must be removed leaving the coal dry and dusty. Preheat air to the pulverizer is usually required for drying. The use of preheat air also permits control of the temperature of the fuel-air mixture to the burners for the most stable ignition. In addition to acting as a drying agent, the air flow provides the velocity required for transporting the fuel to the burners. The velocity in the conveyor lines must be sufficiently high to prevent settling and drifting of coal. At the burners the air-coal mixture must be uniform and the velocity suitable so as to prevent flashing back of the flame, and to allow stable ignition at all times. To meet these conditions velocity must be varied with changes in ratio of air to coal in the mixture.

BURNERS

Pulverized fuel burners are installed in three different planes, depending on the type of boiler, the available combustion space and the kind of burner. The direction of firing may be classified as either horizontal, vertical, or tangential. One manufacturer uses an adjustable burner which is tilted upward or downward to control the furnace outlet temperatures. In many instances, burners are of the combination type and are designed to burn either pulverized fuel, oil, or gas, or all three. The most frequently used burners are the circular and cell types.

FURNACE TYPES

Pulverized-coal fired units are usually one of two basic types, wet-bottom or dry-bottom. The temperature in a wet-bottom furnace is maintained above the ash fusion temperature, thus the slag is melted so that it can be removed from the bottom as a liquid. The liquid is quenched and accumulates in storage tanks under the furnace. The dry-bottom furnace maintains a temperature below this point so that the ash will not fuse and is removed as dry ash. Whether a furnace is dry-bottom or wet-bottom affects emissions. About 80% of the ash originally in the coal leaves a dry-bottom furnace entrained in the flue gases. In wet-bottom or slag-tap furnaces, as much as 50% of the ash may be retained in the furnace.

Cyclone Furnace

In pulverized coal fired units discussed above, the furnace has a double function. It must maintain the high temperatures necessary for complete combustion and at the same time cool gases resulting from combustion so that when they enter the heat exchangers they are below the temperatures at which slagging occurs. Excessive slag on surfaces reduces the transfer of heat to produce steam. The furnace consequently has to be relatively large to allow these conflicting functions to occur. The Cyclone Furnace was developed to obtain more efficient combustion by separating these functions. The idea was to provide a small combustion chamber where high turbulence and temperature may be maintained and to use the main boiler furnace primarily to cool the combustion gases.

The Cyclone Furnace (Figure 2.5) is a water-cooled horizontal cylinder in which fuel is fired and heat is released at an extremely high rate for the volume of the furnace. Coal is crushed in a simple crusher so that approximately 90 percent passes through a 4-mesh screen. The fuel is introduced at the burner end of the Cyclone, and air for combustion is admitted tangentially. Combustion occurs at heat-release rates of 14,000 to 25,200 BTU per cubic meter (500,000 to 900,000 BTU per cubic foot) per hour at gas temperatures sufficiently high to melt a high percentage of the ash into a liquid slag. The slag is discharged from the bottom of the furnace through a slag tap opening.

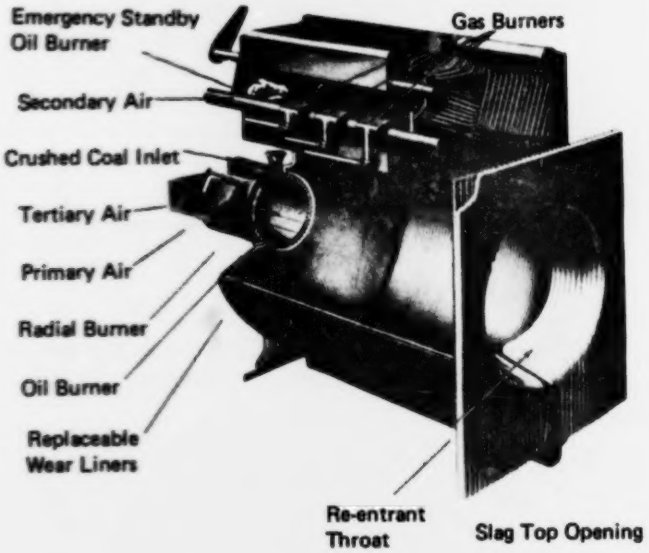

Emergency Standby Oil Burner
Gas Burners
Secondary Air
Crushed Coal Inlet
Tertiary Air
Primary Air
Radial Burner
Oil Burner
Replaceable Wear Liners
Re-entrant Throat
Slag Top Opening

Figure 2.5 Cyclone Furnace operation[5]

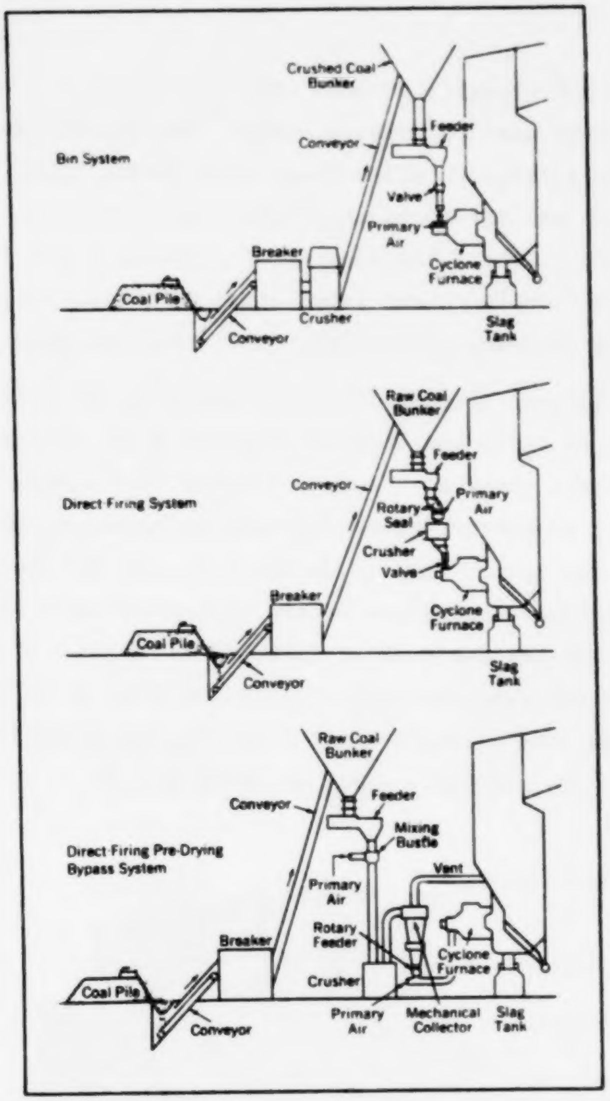

Bin System
Crushed Coal Bunker
Conveyor
Feeder
Valve
Primary Air
Breaker
Cyclone Furnace
Coal Pile
Crusher
Conveyor
Slag Tank
Direct Firing System
Raw Coal Bunker
Conveyor
Feeder
Rotary Seal
Primary Air
Crusher
Valve
Breaker
Cyclone Furnace
Coal Pile
Conveyor
Slag Tank
Direct Firing Pre-Drying Bypass System
Raw Coal Bunker
Conveyor
Feeder
Mixing Bustle
Vent
Primary Air
Rotary Feeder
Breaker
Cyclone Furnace
Crusher
Coal Pile
Conveyor
Primary Air
Mechanical Collector
Slag Tank

Figure 2.6 Bin, direct-firing, and direct-firing pre-drying bypass systems for coal preparation and feeding to the Cyclone Furnace (schematic).

COAL PREPARATION

The Cyclone Furnace is capable of successfully burning a wide range of coals varying in rank from low volatile bituminous to lignite. The Cyclone is able to use any size of fuel available. Fuel oils and gases are also suitable for firing.

There are two types of coal preparation and feeding, (See Figure 2.6) the bin or storage system, and the direct-firing system. With the bin system coal is crushed in a central preparation plant to a size suitable for firing and delivered to the bunker. Because the crushed coal is relatively large in particle size, the hazards associated with pulverized-coal systems do not exist.

The direct-firing system has a separate crusher located between the feeder and the burner of each Cyclone Furnace. The crusher is swept by hot air which helps to dry the coal. This improves crusher performance and ignition with high moisture coals.

The pre-drying bypass system is a variation of the direct-firing system. It incorporates a mechanical dust collector between the crusher and the Cyclone Furnace. The dust collector is vented to the boiler furnace. This system is used when firing extremely high moisture coals because the moisture is removed from the coal during crushing and then vented to the boiler furnace instead of the Cyclone Furnace.

The two general firing arrangements used for the Cyclone Furnace are one-wall firing and opposed firing. These are shown in Figure 2.7.

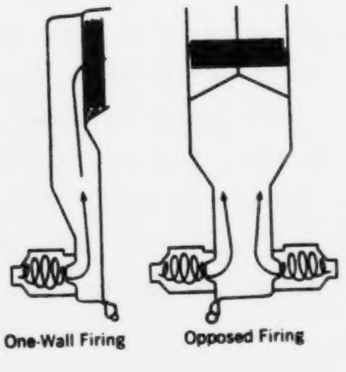


Figure 2.7 Firing arrangements used with Cyclone Furnaces[5]

EXCESS AIR

The excess air required for satisfactory combustion is less than 10 percent. However, when there are several Cyclones and where automatic controls are used, excess air is usually maintained between 10% and 15% to assure no individual Cyclone is operating with insufficient air.

ASH REMOVAL

By the Cyclone Furnace method of combustion the fuel is burned quickly in suspension. Most of the ash is retained as a liquid slag and tapped into the slag tank under the boiler furnace. Up to 70% to 80% of the total ash is retained and only 20% to 30% leaves the furnace as dry ash in the flue gas. Air pollution control equipment is placed ahead of the stack to prevent the ejection of large quantities of this ash to the atmosphere.

Oil Burning Furnaces

The chief advantages of fuel-oil over coal in the generation of steam are that it can be easily moved from the storage tank to the place of use, the burning equipment is simple and easy to operate, and it has very little ash content compared to coal. The important properties of oil are: (1) specific gravity, (2) heating value, (3) viscosity, (4) flash point, (5) fire point, (6) sulfur content, (7) ash content, and (8) pour point.

Specific gravity is the ratio of the weight of a volume of oil to the weight of the same volume of water at 60F. Heating value is expressed in BTU per liter (gallon) or per kilogram (pound) at 60F. Viscosity is defined as the measure of resistance to flow. Flash point is the temperature at which sufficient vapor is given off to form a momentary flash when flame is brought near the oil surface. The sulfur and ash are, of course, undesirable elements in fuel oil. Pour point represents the lowest temperature at which oil flows under standard conditions.

The National Bureau of Standards has established specifications for five grades of fuel oil. The descriptions of these grades are given in Table 2.1. The grades are numbered from light to heavy. Distillates are lighter oils and residuals are heavier oils. Generally, grades of oil heavier than No. 2 must be heated to reduce viscosity.

Table 2.1. National Bureau of Standards Grades for Fuel Oil

NUMBER	DESCRIPTION OF FUEL OIL
1.	Distillate oil for use in burners requiring volatile fuel.
2.	Distillate oil for use in burners requiring a moderately volatile fuel.
3.	Distillate oil for use in burners requiring a low-viscosity fuel.
5.	Residual oil for use in burners requiring a medium viscosity fuel.
6.	Residual oil for use in burners equipped with pre-heaters, permitting a high viscosity fuel.

Fuel-oils of No. 1 and No. 2 grades, the distillate fuels, are usually used to heat homes and domestic hot water. No. 2 fuel-oil is used in small apartment houses and in industrial processes. The firing rate is usually not more than 75 to 95 liters (20 to 25 gallons) per hour.

Distillate oils of No. 2 and 3 grades are fired in large apartments, small industrial plants, and other commercial establishments up to 189 liters (50 gallons) per hour. Fuel-oils No. 5, light and heavy, are used in installations burning more than 189 to 378 liters (50 to 100 gallons) per hour respectively. Fuel-oil No. 5 possesses greater heating value. Fuel-oil grade No. 6 is used in power generating stations, marine vessels, and other large installations, and is fired at rates greater than 189 liters (50 gallons) per hour. The sulfur content of No. 1 distillate will vary from .04 -.124%, and of No. 2 distillate from .104 -.307%. The sulfur content in grade 6, residual oils, will range from 0.9 - 3.2% by weight.

When oil viscosity is not satisfactory, preheaters must be used, particularly with grades 5 and 6 oil. Oil preheaters are used to improve viscosity, and may be mounted directly on the burner, at the supply tank or any place in between. Preheaters operate with either electricity or steam. Typical oil preheat temperatures necessary to obtain a suitable viscosity for atomization are usually between 150° and 200°F.

The principal air contaminants affected by burner design and operation are oxidizable materials: carbon, carbon monoxide, aldehydes, organic acids, unburned hydrocarbons, soot, and other particulates. The principal causes of smoke and incomplete combustion are:

1. Burner and fuel not compatible.
2. Burner not properly adjusted or operated.
3. Burner improperly maintained.

OIL BURNERS

The burner is the principle equipment component for the firing of oil. Burners are normally located in the vertical walls of the furnace, but may be installed in the horizontal wall. The types of burners most frequently used are circular and cell burners similar to those used in pulverized coal burning systems. (See Figures 2.8 and 2.9.)

In order to burn fuel-oil at high rates it is necessary for the oil to be "atomized", or dispersed into the furnace as a fine mist. Atomization allows an intimate mixture of air and fuel. It exposes a large amount of oil particle surface for contact with the air to assure prompt ignition and rapid combustion.

Burners are classified according to the method used for securing atomization: (1) air-atomizing burners, (2) steam-atomizing burners, and (3) mechanical-atomizing burners. The cost of supplying compressed air has limited the use of air-atomizing burners in industrial installations.

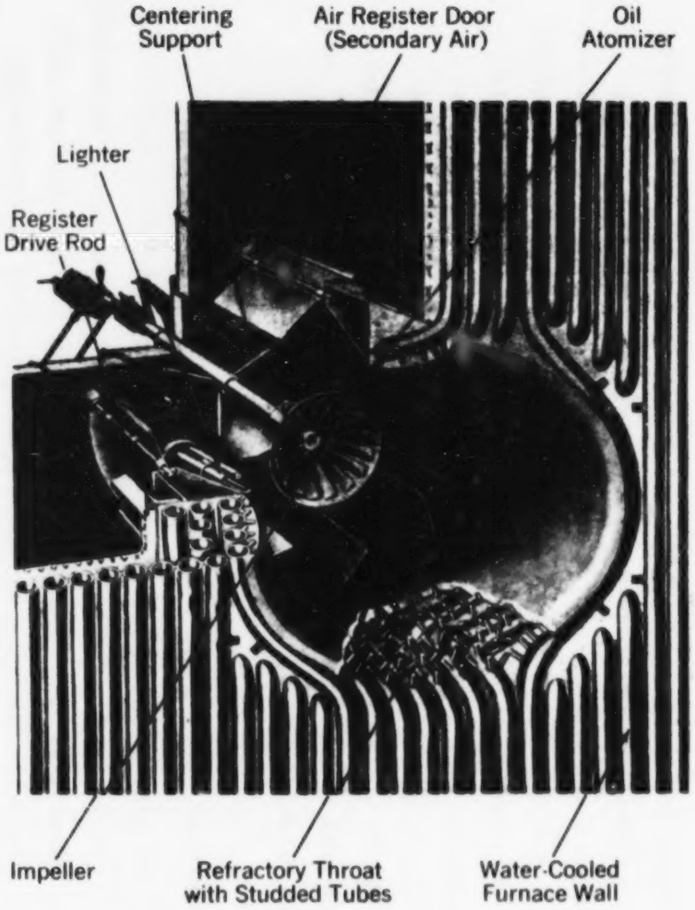

Centering Support
Air Register Door (Secondary Air)
Oil Atomizer
Lighter
Register Drive Rod
Impeller
Refractory Throat with Studded Tubes
Water-Cooled Furnace Wall

Figure 2-8. Circular register burner for oil burning.

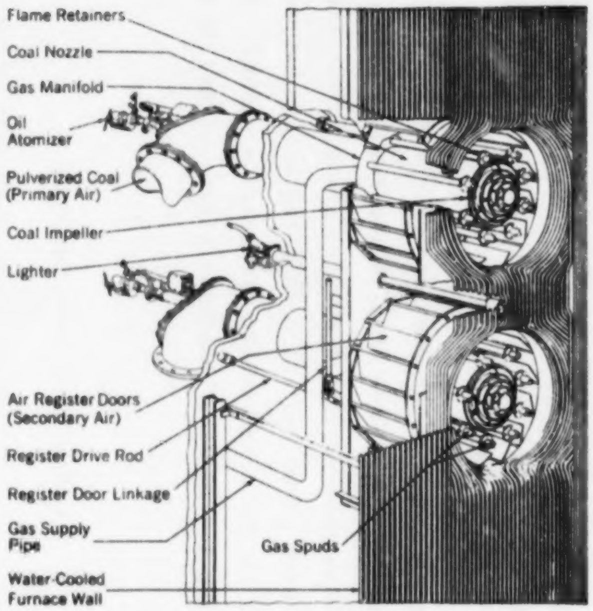

Flame Retainers
Coal Nozzle
Gas Manifold
Oil Atomizer
Pulverized Coal (Primary Air)
Coal Impeller
Lighter
Air Register Doors (Secondary Air)
Register Drive Rod
Register Door Linkage
Gas Supply Pipe
Water-Cooled Furnace Wall
Gas Spuds

Figure 2-9. Cell burner for pulverized coal, oil and natural gas firing.

Steam atomizers, as a class, possess the ability to burn almost any fuel oil, of any viscosity at almost any temperature. These burners may be sub-divided into two groups: (1) internal-mixing or premixing oil and steam inside the body or tip of the burner before being sprayed into the furnace, and (2) external-mixing in which oil emerging from the burner is caught by a jet of steam or air.

In the mechanical atomizer the pressure of the fuel itself is used as the means for atomization. Good atomization results when oil, under high pressure is discharged through a small orifice, often aided by a slotted disk. The disk gives the oil a whirling motion before it passes on through the hole in the nozzle where atomization occurs. Finally, because oil fuels are low in ash, scheduled cleanouts may be a couple of times a year.

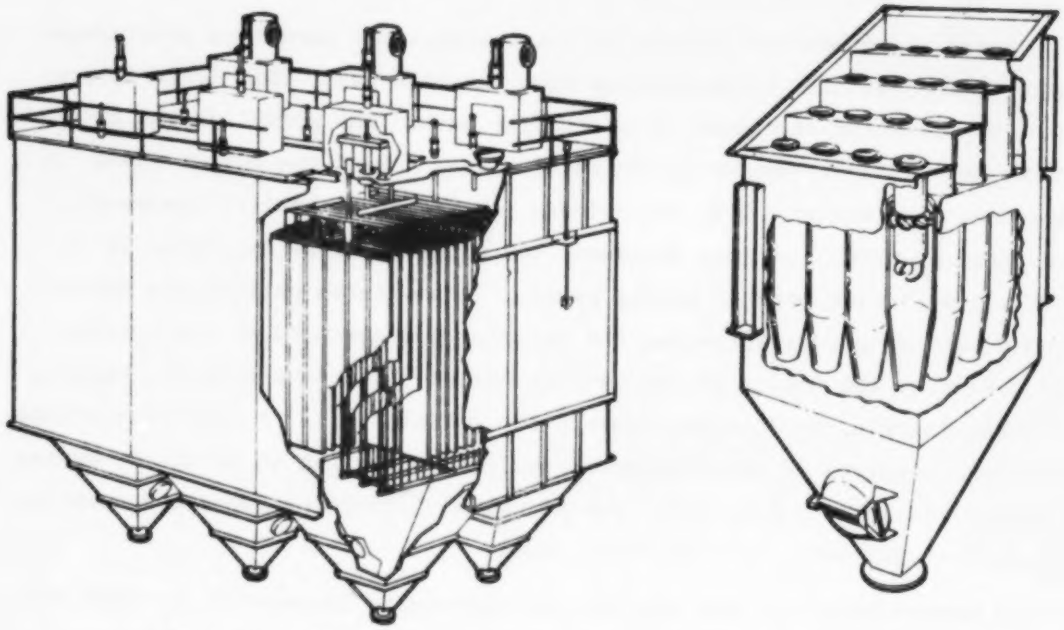
Air Pollution Control Equipment

To meet the objective of a clear stack, some form of particulate-removal equipment is required to remove fly ash from flue gases from units where fuel is burned in suspension.

Air pollution control equipment may be classified into two groups, equipment controlling particulate matter, and equipment controlling gaseous emissions. Because oil fuels are low in ash and sulfur, plants using oil typically do not have associated air pollution control equipment. In this Workbook devices for the control of particulate matter on the equipment just presented have been grouped into three classes: inertial separators, wet collection devices, and electrical precipitators. Figure 2.10 shows illustrations of each type. Fabric filters (baghouses) are not discussed because they are not currently being used to control emissions from fossil fuel fired combustion sources.

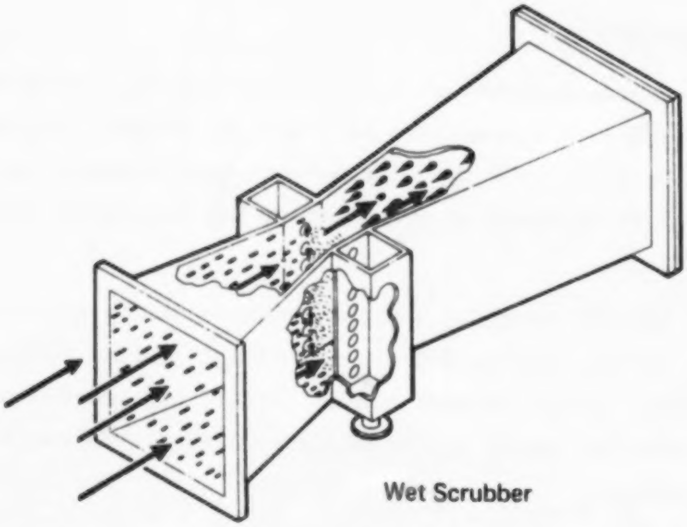
INERTIAL SEPARATORS

Inertial separators are the most widely used devices for collecting medium and coarse-sized particulates, above 10 to 20 microns. Collection efficiency is usually not high, although suitable for medium-sized particulates. Ordinary inertial separators are generally unsuitable for



Electrostatic Precipitator

Inertial Separator



Wet Scrubber

Figure 2.10 Air pollution control equipment

for fine dusts ranging from 5 to 10 microns. Below 10 microns the efficiency drops below 90 percent.

Inertial separators operate by the principle of imparting centrifugal force to the particle to be removed from the flue gas. This force is produced by directing the gases in a circular path. The spiral of the circular motion of the gases force the particulates toward the outlet where they drop into a dust-tight bin and are removed by mechanical conveyors, pneumatic or steam ejection systems. The single cyclone separator is an inertial separator without moving parts. It separates particulate matter from a carrier gas by spiraling the entering gas downward at the outside and upward at the inside of the cyclone outlet. The particulates, because of their inertia, tend to move toward the outside wall. A multiple-cyclone separator consists of small-diameter cyclones operating in parallel, having a common gas inlet and outlet. Another type of inertial separator supplies the centrifugal force by a rotating vane.

A common cause of poor cyclone performance is leakage of air into the dust outlet. A small air leak at this point can result in a substantial decrease in collection efficiency.

WET COLLECTION DEVICES

Wet collection devices use a variety of methods to wet the contaminant particles in order to remove them from the gas stream. A good wet scrubber is one that can effect the most intimate contact between the gas stream and the liquid for the purpose of transferring the suspended particle from the gas to the liquid.

Because the wet scrubber employs a liquid stream to collect particulate matter, it can usually perform additional process functions besides dust collecting. Simultaneous removal of dust and gaseous pollutants such as sulfur oxides by use of a suitable scrubbing liquid can be accomplished with a wet scrubber.

There are a variety of different types of wet collection devices. The simplest type of scrubber is a chamber in which spray nozzels are placed. Gases are sprayed with a liquid as they pass through the chambers. In some types of scrubbers the water spray is generated by a rotating element such as a drum or disk. The collection efficiency of a scrubber varies according to the type and size of particulate matter.

ELECTRICAL PRECIPITATORS

The electrical precipitators work on the principle that substances with the opposite electric charge attract each other. The particles entrained in the flue gases are given a negative charge. The negatively charged particles in the presence of positively charged collecting plates are attracted to the plates. The collected dust accumulates on the plates and is discharged by rappers. The rapping of the plates discharges the collected dust into storage hoppers.

The use of electrical precipitators has grown because of the many inherent advantages in the method. High efficiency can be attained because very small particles can be collected. There is no theoretical lower limit to the size of the particle that can be collected. Precipitators are easy to maintain over long periods of time because they have no moving parts. They can be used in extremely high temperatures and will collect a variety of types of particulate matter.

SELF-EVALUATION QUESTIONNAIRE I

Below are statements which describe the basic parameters and the proper operating practices of the fuel-burning systems covered in Chapter Two. Read each statement and check the system or systems it best describes. Some statements are descriptive of more than one system. First, try to answer each without referring back to the text. Then, for those you are uncertain about or cannot answer, you may refer back to the text.

Basic Design Parameters and Proper Operating Practices	Cyclone Furnace	Spreader Stoker	Pulverized Coal Burner	Oil Burner
1. An important advantage is its ability to burn fuels with a wide range of burning characteristics.				
2. Permits continuous use of raw coal directly from bunkers where coal is stored in condition received at the plant.				
3. Permits suspension burning of fuel in the furnace.				
4. Able to use coal of any size available.				
5. Requires the fuel to be atomized.				
6. Can burn either coal or oil.				
7. Uses circular burners and cell burners				
8. All ash particles are formed in suspension.				
9. Three systems of fuel preparation and feed are bin, direct-firing, and direct-firing pre-drying bypass.				

Basic Design Parameters and Proper Operating Practices	Cyclone Furnace	Spreader Stoker	Pulverized Coal Burner	Oil Burner
10. Requires coal in a fine powder form (70% will pass a 200-mesh screen).				
11. The proper size coal ranges from 1.90 centimeters (3/4 inches) and under to 5 centimeters (2 inches).				
12. Moves coal from the supply hopper over an adjustable spill plate to fall onto a rotor equipped with curved blades for distributing the coal over the furnace area.				
13. Requires hot primary air to dry the coal and convey it to the furnace.				
14. Two basic types of furnaces are wet or slag-bottom and dry-bottom.				
15. Requires that certain grades of fuel be heated before they can be used.				
16. Burners may be arranged vertically, horizontally, and tangentially.				
17. Requires few ash cleanouts.				
18. About 70-80% of total ash is retained and only 20-30% leaves as dry ash in flue.				
19. Molten ash drains toward furnace bottom and is removed through tap holes, quenched and is accumulated in storage tanks under the furnace.				
20. Ash discharged in pits is fairly large; ranging from popcorn size to the size of a man's fist.				

	Basic Design Parameters and Good Operating Practices	Cyclone Furnace	Spreader Stoker	Pulverized Coal Burner	Oil Burner
21.	About 80% of the ash originally in the coal leaves a dry-bottom furnace entrained in the flue gases.				
22.	Fuel is fired and heat is released at an extremely high ratio for given volume.				
23.	Burners may be located in vertical or horizontal wall of the furnace.				
24.	Coal is crushed so that 90% passes through a 4-mesh screen.				
25.	Transports coal at sufficiently high velocities to prevent settling and drifting of coal.				
26.	The ideal fuel bed is evenly distributed and from 5 to 10 centimeters (2 to 4 inches) thick.				
27.	Turbulence is created by forced draft fans for both undergrate and overfire air.				
28.	Because a large quantity of ash particles, some unburned and some still burning fuel, is carried over with the flue gases, dust collectors for fly ash reinjection are often used.				

Answer the following questions.

29. The three types of grates which may be used on a spreader stoker are ______________________________

Identify the type of grate described by each statement.

30. a. Requires manual ash removal and is limited to boilers of 9,000 to 13,690 kg (20,000 to 30,000 lbs.) of steam per hour capacity. ______________

31. b. Has grate sections for each feeder and the undergrate air plenum chambers are correspondingly divided permitting temporary discontinuance of fuel air supply to a grate section for ash removal without affecting other sections of the stoker. ______________

32. c. No interruptions for removing ashes. Its maximum size is usually up to about 48.77 square meters (525 square feet) of grate and produces over 181,000 kg (400,000 lbs.) of steam per hour. ______________

Below are statements which describe the basic theory, collection and associated disposal system of the air pollution control equipment covered in Chapter Two. Read each statement and check the equipment it describes. There should be only one check mark for each statement. First try to answer without referring back. Then if necessary, refer back.

Basic Theory and Associated Disposal Systems	Electrostatic Precipitators	Inertial Separators	Wet Scrubbers
33. Collects particles by contact with a liquid droplet.			
34. Executes centrifugal force on the particles to be separated.			
35. Most efficient for large particles (above 10 to 20 microns).			
36. No theoretical lower limit to the size of the particle that can be collected.			
37. Collection efficiency varies according to size and type of particulate matter.			
38. Charged particles are attracted to collecting plates.			

CHAPTER 3. INSPECTION POINTS AND OBSERVATIONS WHICH SHOULD BE MADE

Introduction

The purpose of an inspection by you, the Field Enforcement Officer (FEO), is to determine whether a source is operating in compliance with acceptable emission regulations. The initial decision regarding compliance is usually made by an experienced engineer. He makes his decision by considering process design and operating characteristics, and by conducting emission stack tests under various furnace operating conditions considered representative of the range of normal operation. This review by the engineer is crucial because it is the foundation for future enforcement actions. Thus, once these initial evaluations have been made, your major responsibility as the FEO is to check that the source is still operating either as specified in the permit application, or under the same conditions as when the source satisfactorily passed the emission source tests. The purpose of a source inspection is to make the following determinations:

> Determine whether the source meets equivalent opacity regulations.
>
> Determine whether the source is operating in accordance with permit conditions.
>
> Determine whether operating and maintenance procedures conform with good practice.
>
> Determine whether good operating and maintenance procedures are used regularly based on a spot check of operations since the last inspection.
>
> Determine whether the air pollution control equipment is operating properly.

The above determinations about a source are made on the basis of an analyses of plant operating records and on the basis of visual observations made during inspection. This chapter covers the visual inspection points and observations which should be made during the inspection tour. It tells you what to look for and provides guidelines for deciding whether or not the conditions you observe on the spot are satisfactory or unsatisfactory. The following inspection points are covered:

Observe plume before entering the plant.

Inspect fuel preparation system.

Inspect furnace interior.

Inspect control panel instrumentation.

Inspect fans and ductwork.

Inspect ash disposal system.

Inspect air pollution control systems.

Observe Plume Before Entering the Plant

The first task in the inspection process is to determine the plume's equivalent opacity. Opacity standards will vary according to local regulations, but generally satisfactory conditions are a clear stack or emissions equivalent to less than 20 percent.

In order to "read" the plume for smoke density, you, of course, must be a qualified smoke reader. Because the judgment about opacity is being made by a human, it is subject to a certain amount of error in measurement. A standard error of measurement for qualified smoke readers is 15 percent. Thus, if a reading of 30 percent is reported, the actual opacity level may range from 15 percent to 45 percent.

Also, note the plume color. When the opacity is high, the color may be a clue to factors to investigate. Table 3.1 presents factors to investigate when opacity is unsatisfactory.

Inspect Fuel Preparation System

COAL FIRED BOILERS

Check the outside coal pile for evidence of windblown dust. Satisfactory conditions exist if no windblown emissions are visible when a small amount of coal is filtered through the fingers and falls to the ground. Check with plant representative to determine if additives are used to suppress windblown dust.

Table 3.1 Plume Characteristics and Operating Parameters

PLUME COLOR	POSSIBLE OPERATING FACTORS TO INVESTIGATE
White	Excessive combustion air; loss of burner flame in oil fired furnace.
Gray	Inadequate air supply or distribution.
Black	Lack of air; clogged or dirty burners, or insufficient atomizing pressure; improper oil preheat; improper size or type of coal.
Reddish Brown	Excessive furnace temperature, burner configuration, or excess air.
Bluish White	High sulfur content in fuel: Fuel should be sampled.

Check the delivery procedure to determine if excessive fines are stirred up as coal is transferred onto the conveyor system. Conditions are unsatisfactory if the dust blows beyond the plant boundaries into the surrounding neighborhood. Windblown emissions which do not go beyond the plant boundaries are not considered a violation.

Check the conveyor system as the source of windblown dust emissions. Satisfactory conditions exist if the system is covered. Unsatisfactory conditions exist when the conveyor is uncovered or when it vibrates to the point that it creates fugitive dust emissions.

For spreader stoker operations check the coal size. A satisfactory range is from 1.9 centimeters to 5 centimeters (3/4 inches to 2 inches).

OIL FIRED BURNERS

Check the oil preheat and atomization pressure gauge for each nozzle. These readings should later be compared with those on the original permit. A sample of the oil may be taken to analyze for sulfur content.

Inspect Furnace Interior

When inspecting the furnace interior, use specially design filters for eye protection. In addition, never open furnace doors, manipulate controls, change valve settings, or in any way interfere with boiler operation. During the inspection process, plant personnel should open the door for inspection purposes.

SPREADER STOKER GRATE CONDITIONS

Check the evenness of the coal distribution on the bed. The coal should be evenly distributed across the width of the grate. The fuel bed thickness should be about 5 centimeters to 10 centimeters (2 inches to 4 inches).

Check the grate to determine if it is unbroken and in good condition. The entire grate may not be observed while the furnace is in operation. If your inspection coincides with the time that a section is down, then of course you can check the grate. However, during operation a small portion of the grate may be visible and you can make some judgments about the entire grate based on the visible portion. If the portion you see is about 30 centimeters square (2 feet square) in size, you may assume the entire grate is in the same concition as the visible section.

SPREADER STOKER BOTTOM ASH

On spreader stokers you should also check the bottom ash in the ash pits. The cooled ash should be about popcorn size, with no pieces larger than a man's hand. It should be white to brown in color with no blackness or clinkers.

FLAME CHARACTERISTICS

The most important indication of good combustion is a clear, steady flame. The flame should look clean. There should be no black tips to the flame and no evidence of smoke or haze. Any streaks or unevenness of the flame indicates unsatisfactory conditions.

Color of the flame is a secondary indication of the adequacy of combustion. Good flame color varies with type of equipment and type of fuel used. For grate systems, such as the spreader stoker, you should note whether the flame is clear and steady. The flame should be yellowish-orange with no dark smoke. Dark smoke means soot and particulate emissions are high. Do not mistake the coals falling onto the live fire bed for unsatisfactory conditons.

For burner systems, such as pulverized coal and oil, a mixture of yellow and blue flames attached to ports indicates correct proportion of air and fuel. Some pulsing of the flame is normal, but a totally blue flame lifting off the ports indicates too much air. Dazzling or bright white flame indicates that the flame temperatures may be sufficiently high to create excessive NO_x emissions.

The presence of black spots indicates poor atomization. Clogged or dirty burners may cause improper atomization. You should check the frequency of cleaning burners to be sure it is the same as on the original permit. In addition, the flame should not impinge on walls and arches of the firebox.

FIREBOX WALLS

From a visual inspection of the furnace interior through observation "peep" holes, firing doors or access doors, recognize that a smooth clean wall indicates a satisfactory condition. Heavy accumulations of ash on the walls is undesirable because it may build up to the extent that it interferes with heat transfer. Ash may also build up to the extent that it interferes with turbulence.

Inspect Control Panel Instrumentation

There is usually a control panel where instruments provide data on such elements as the stack opacity, the air-flow/steam-flow relationship, CO_2 concentration and O_2 levels. Instrumentation varies from plant to plant, but opacity and steam-flow/air-flow meters are included in most boiler installations.

THE OPACITY CHART

The chart on which a record of the density of emissions from the stack is recorded may be called a smoke chart, a density chart, or an opacity chart. A single opacity chart is capable of displaying the opacity percentages for a 24-hour period. Figure 3.1 shows an opacity chart. The 24 hours, with 15-minute intervals, are marked off around the outer rim of the circular chart. The numbers radiating from the center indicate percentages. A pen continuously records the percent of opacity. By studying the chart you can determine the percentage of opacity for any point in a dav. For example, at 2:00 a.m. and at 5:15 A.M. the opacity percentage in Figure 3.1 rose above 20 percent opacity. But, from 6:00 a.m. until 10:00 a.m. the stack was satisfactory. What was the stack reading at 2:00 p.m.?

Not all opacity charts are round. Figure 3.2 shows a meter which records opacity on a horizontal chart. It too, is marked off in 15-minute intervals. The heavier lines indicate 30-minute intervals with the lighter line showing the 15-minute point in between. Only about an hour is visible through the window. In order to see the entire 24-hour period, the chart must be removed from the meter.

An opacity chart shows unsatisfactory conditions if there are any deviations above 20 percent for more than 3 minutes. Deviations above 20 percent for less than 3 minutes in any one hour are usually allowable. For example, soot blowing schedules, which are allowable, may account for deviations. When soot blowers are in operation particulate matter concentrations in exit gases increase markedly. The frequency of soot blowing schedules varies depending upon the fuel burned and the size of the operation. Soot blowing once every shift for a duration of 30 minutes, if performed sequentially is usually allowed. Large plants may have continuous systems. By increasing the frequency of schedules or by lengthening the total operation, a plant can be technically in compliance.

STEAM-FLOW/AIR-FLOW RECORDERS

The amount of total combustion air used in a boiler can be established by metering the flow of air through the unit. A given total air-flow, measured by a meter, has a straight line relationship to the steam output. The steam-flow/air-flow meter is one of the most widely used flow meters. It measures not only steam-flow from the boiler, but also the relative rate of combustion air-flow to the furnace. Some boilers have maximum design rates, and you should compare the steam-flow rate for the individual boilers

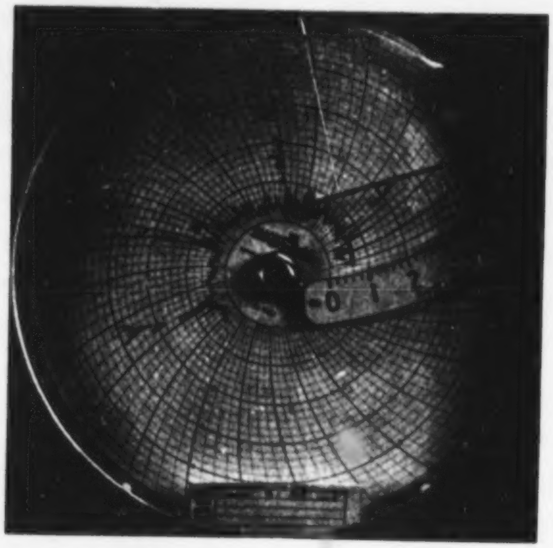


Figure 3.1 Opacity chart

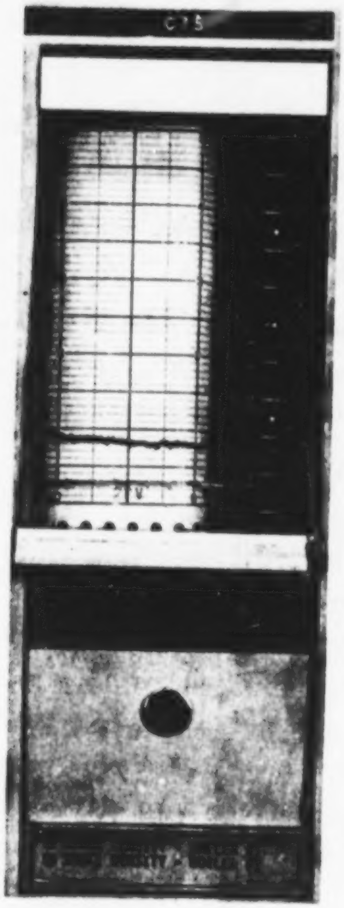


Figure 3.2 Opacity chart

with the maximum design value listed on the permit. Rates above the maximum design values will lead to excessive emission. Low loads may cause smoking if the correct amount of combustion air is not maintained.

The steam-flow and air-flow pens are adjusted on the basis of actual tests, and are set so that calibrated, they both coincide. That is, they follow the same path around the dial, one on top of the other, (See Figure 3.3) or are modified to follow parallel paths. Figure 3.4 shows a steam-flow/air-flow chart calibrated to record measurement about 1 inch apart. The air-flow and steam-flow are usually recorded in different color inks.

Ask the operator when the steam-flow/air-flow meter was last calibrated. Also, inquire if the pens read "true" values or if the pen trace has been modified. Modified instrumentation may include a scale factor. If more than a year has passed since calibration, or if there is doubt about the accuracy of the reading, request that it be calibrated.

For steam-flow/air-flow recorders, compare chart values with the following guides:

> Air-flow should read between 10 and 25 percent higher than steam-flow for coal fired operations.
>
> Air-flow and steam-flow should read approximately the same value for oil operations.

Air-flow above steam-flow shows too much air or too little fuel. Air-flow below steam-flow shows too little air or too much fuel. In other words, the air to fuel ratio is incorrect and combustion is less efficient.

However, because calibrations differ from plant to plant, you can make some determination of conditions by looking at the relationship of the two pens. From a visual inspection, you can tell whether conditions are satisfactory or not. If the steam-flow and air-flow pens trace essentially the same paths, conditions are ideal. That is, if the air-flow trace goes up, the steam-flow trace should follow it and vice versa. However, ideal situations rarely exist and some deviation is allowable. From an air pollution standpoint, it is better to err in the direction of too much air. While this reduces combustion efficiency, it does not critically affect air pollution. However, when steam-flow is above air-flow, this does indicate an

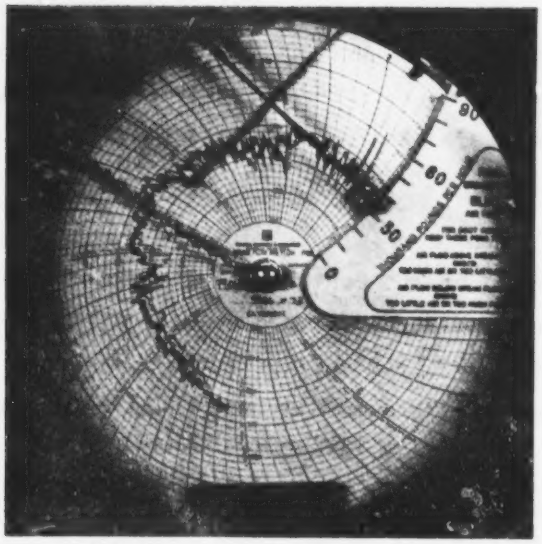


Figure 3.3 Steam flow/air flow pens calibrated to coincide

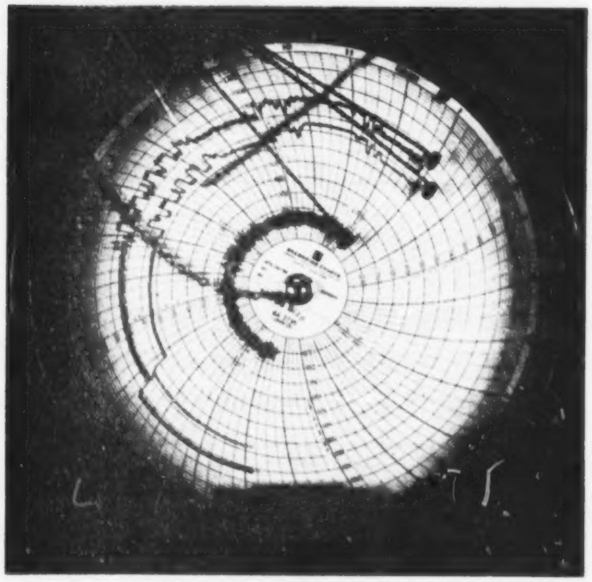


Figure 3.4 Steam flow/air flow pens modified to show parallel traces

air pollution problem. Instantaneous peaking of steam-flow above air-flow is allowable. Figure 3.3 shows instantaneous spikes of steam-flow at about 2:15 p.m. and 2:30 p.m. Of course, any extended period of steam-flow above air-flow is undesirable. An extended period is defined as three minutes. If you study Figure 3.3 carefully you will note that steam-flow rises above air-flow on several occasions. The traces may coincide or parallel each other. Do the pen traces in Figure 3.3 show satisfactory or unsatisfactory conditions? How about Figure 3.4?

CO_2 MEASUREMENTS

CO_2 measurements may be on the control panel board or may be taken manually. Figure 3.5 shows an automatic CO_2 recorder. Rate CO_2 measurements according to the guides in Table 3.2. These values are only guides and individual boilers may depart somewhat from these guides depending on the original design.

Table 3.2 Guides for CO_2 Concentration in Flue Gas Leaving Furnace

Spreader stoker:	10 to 12 percent
Pulverized coal burner:	12 to 14 percent
Cyclone furnaces:	12 to 14 percent
Residual oil:	12 to 14 percent
Distillate oil:	10 to 12 percent

OXYGEN MEASUREMENTS

O_2 measurements are sometimes on the control panel. Rate O_2 measurements according to the guides in Table 3.3. Again, these values are only guides and individual boilers may depart somewhat from these guides.

Table 3.3 Guides for O_2 Levels in Combustion

Spreader stoker:	3 to 9 percent
Pulverized coal burner:	3 to 6 percent
Cyclone furnace:	3 to 6 percent
Residual oil:	3 to 6 percent
Distillate oil:	3 to 6 percent

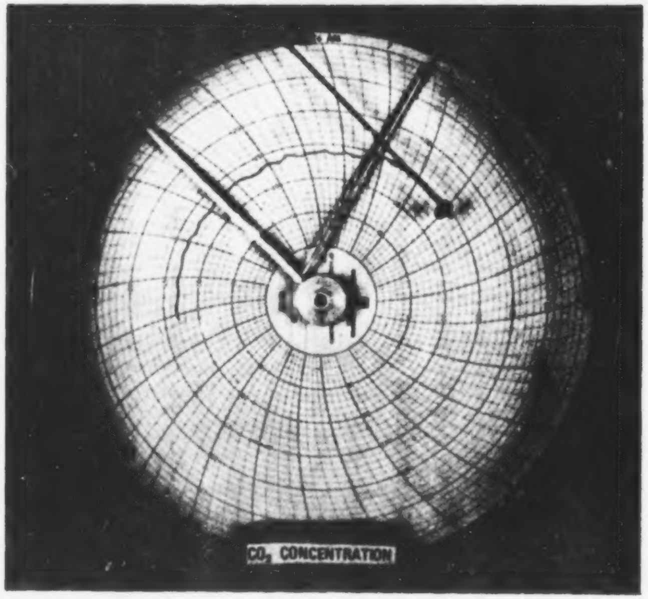

CO_2 CONCENTRATION

Figure 3.5 CO_2 concentration recorded continuously

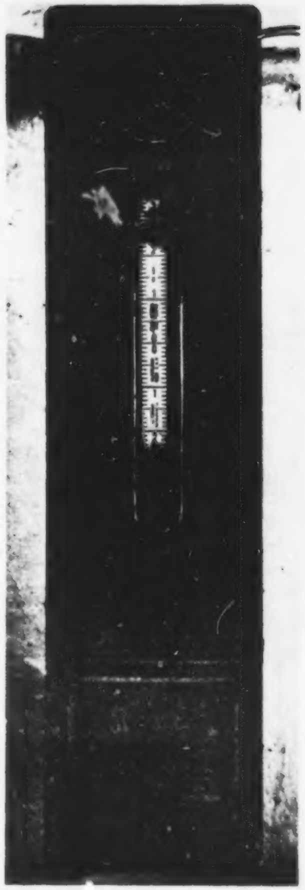


Figure 3.6 Pressure drop gauge

Inspect Fans and Duct Work

Inspect breechings and air ducts through air heaters, economizers and super heaters for cracks and holes. Check the fan to be sure it is operating properly; that no obstructions are impeding the air flow, that all blades are intact, that vibration is not excessive and that there are no holes or cracks in connections to duct work.

Inspect Ash Disposal Systems

Check both furnace bottom ash and control equipment ash hoppers for correct ash handling procedures. Ash from hoppers should not drop significant distances into trucks used for transfer of ash. Visible dust emissions should not be present during loading of ash into trucks. Ash should be moistened before transport to minimize fugitive dust emissions. Trucks which convey ash to disposal area should be covered or sufficiently wetted to prevent windblown emissions beyond the plant boundary.

Inspect Air Pollution Control Systems

INERTIAL SEPARATORS

Inertial separators and electrostatic precipitators are the devices most commonly used for particulate emission control. The most important guide to their performance is the condition of the plume. If the plume opacity is greater than it was under similar boiler load conditions at an earlier time, either the collection efficiency of the controls has decreased or the fuel quality has decreased.

Visual checks should include checking the pressure drop gauge and checking the exterior of the air pollution control device for cracks or air leaks. Be sure to check around doors or other openings used for cleaning out collected fly-ash. Air leaks caused by holes will change the air flow pattern and decrease the device's efficiency.

A simple U-shaped tube half filled with water may be used as a pressure-drop-gauge. One leg is connected to a duct in which the pressure is to be measured. The other leg is open to the atmospheric pressure outside the duct. The gauge then shows the difference between the pressure within the duct and atmospheric pressure. The pressure in the duct could be more or less than atmospheric pressure. The difference in levels is measured in centimeters (inches) of water. What is the pressure drop in centimeters (inches) on the pressure-drop-gauge in Figure 3.6?

Inertial separators commonly operate with pressure drops of 5 to 15.24 centimeters (2 to 6 inches) of water depending on design. Greater pressure drops indicate plugged cones or hoppers; lesser pressure drop may be due to erosion of internal components which would substantially reduce the collection efficiency.

ELECTROSTATIC PRECIPITATORS

Your task in inspecting the electrostatic precipitator is to record data from each section to compare with data on the original permit. You should check the spark-rate meter for each section. The meter should read approximately 100 sparks/minute for the most efficient operation. This value, however, varies significantly from one installation to another. You should also read and note the secondary or precipitator current and voltage for each section and compare with original permit data.

As part of your inspection, you should also (1) check to determine if new sources are being vented through the precipitator; (2) check maintenance records regarding wire breakage; and (3) check frequency of ash removal to determine if schedule complies with original permit.

WET SCRUBBERS

Wet scrubbers are used to a limited extent in combustion processes, primarily for controlling SO_2. Inspection procedures include recording scrubber liquid-to-gas ratio, recording pressure drop rate and obtaining records of the acidity levels of liquid to compare with original permit.

SELF-EVALUATION QUESTIONNAIRE II

Below are statements describing conditions you might find during a fuel-burning equipment inspection. Read each statement and check whether or not it describes a satisfactory or unsatisfactory condition. Try to answer each question without referring back to the text. Then, refer back for guidance if needed or to confirm your answers.

Conditions Found During a Fuel-Burning Equipment Inspection	Rate Conditions	
	Satisfactory	Unsatisfactory
1. The opacity of the plume is 30 percent and the color is white.		
2. The opacity of the plume is 10 percent and the color is gray.		
3. On the smoke chart, you note at 2:00 p.m. that opacity was at 70 percent for about a minute.		
4. You are inspecting a spreader stoker and find a CO_2 concentration of 15 percent.		
5. During ash disposal the ash is wetted down as it is dumped into trucks.		
6. The pressure drop on an inertial separator is seven inches.		
7. On an electrostatic precipitator bus section the voltage meter reads zero.		
8. The fuel bed thickness in a spreader stoker is about 5 to 10 centimeters (2 to 4 inches).		

Conditions Found During a Fuel-Burning Equipment Inspection	Rate Conditions	
	Satisfactory	Unsatisfactory
9. Flames from a pulverized coal burner are impinging on the wall.		
10. The flame in the spreader stoker has black tips.		
11. The coal for a cyclone furnace arrives at the plant in pieces about 12.70 centimeters (5 inches) in diameter.		
12. Soot blowing is performed sequentially once every shift for a duration of 30 minutes.		
13. During dumping onto the conveyor system, a small amount of fines are stirred up and they blow beyond the plant boundary.		
14. The flame in the spreader stoker is a clear yellow-orange.		
15. Looking through the flame of a spreader stoker, the larger pieces of fuel are seen falling onto the fuel bed.		
16. The oxygen level for a residual oil fired boiler is 8 percent.		
17. Steam-flow pen traces are above air-flow traces for three minutes in an hour.		

CHAPTER 4. SOURCES INSPECTED IN THE FILM

Introduction

The Film you will see as part of this module simulates the inspection of fuel-burning equipment sources typical of those you will be inspecting on the job. The Film is divided into three parts:

Part I:	Inspecting a plant which has a pulverized coal burner. This part also includes information on the inspection of a Cyclone Furnace.
Part II:	Inspecting a plant which has a spreader stoker.
Part III:	Inspecting a plant which has an oil burner for residual or distillate oils.

Your Job While Viewing the Film

While you are watching the Film, you will be required to make decisions about the adequacy of conditions at the plants depicted in the Film. That is, you will have to rate some of the conditions shown in the Film and record your decision on a form which will be provided for that purpose. The Data Collection Forms for each part of the Film are included in this chapter. These are completed while viewing the Film. The Film will show a FEO inspecting some component of a plant operation. Then the narrator will ask you to make an evaluation about what you have just seen. You will record your evaluation on the Data Collection Form. For example, as the FEO is checking the ash disposal method, you will also watch the method of ash disposal used at the plant being inspected. The narrator will explain the procedure as you watch it. Then he will ask you to rate the ash disposal method as being satisfactory or unsatisfactory. A statement directing you to record your decision will appear on the screen for several seconds to allow you enough time to enter your decision on the form. At the completion of each part of the Film the projector will be stopped to allow you to make some additional decisions and to check your decisions against the decisions made by the "seasoned" FEO in the Film. You will not be required to make a decision on each and every inspection point shown in the Film. Some data gathered during inspection has to be compared to the original permit after the inspection has been completed. The Steps below outline your task while watching the Film.

Step 1. Before viewing Part I of the Film, read the information about the plant to be inspected and look at the photographs of the plant. By studying these photographs you will get a preview of the inspection points covered in the Film.

Step 2. Review the "Data Collection Form: Pulverized Coal Burner" to see which inspection points you will have to make decisions about.

Step 3. View Part I of the Film and record your decisions on the Data Collection Form.

Step 4. The projector will stop after Part I is completed. After viewing Part I, review the photographs of the plant for additional information on any inspection point you are uncertain about.

Step 5. Check your decisions against those of the "seasoned" FEO. The course Instructor will provide you with the FEO's results.

Step 6. Follow Steps 1 through 5 for Part II of the Film.

Step 7. Follow Steps 1 through 5 for Part III of the Film. Film.

Information About the Sources to be Inspected in the Film

PART I: PULVERIZED COAL BURNING FURNACE

The plant in Part I of the Film is the Riverdale plant of a large power company. The plant uses a pulverized coal burner system. The air pollution control equipment are electrostatic precipitators. This plant has been issued an operating permit.

During the course of the Film you will be directed to perform the following ten inspection tasks:

1. Record opacity percentage.
2. Rate condition of steam-flow/air-flow as satisfactory or unsatisfactory.
3. Rate condition of emissions as shown by opacity chart.
4. Rate the CO_2 concentration as satisfactory or unsatisfactory. (A CO_2 concentration guide is presented opposite the Data Collection Form.)
5. Rate condition of flame.
6. Rate condition of furnace walls.
7. Rate condition of fan.
8. Rate adequacy of ash disposal.
9. Rate adequacy of conveyor system.
10. Rate extent of windblown emissions.

In addition to the above, you will observe the inspector recording data from the electrostatic precipitator for comparison with the original permit.

The Data Collection Form to be used while viewing the Film is on page 55. Photographs of some of the inspection points follow the Data Collection Form. You may want to refer back to chapter 3 to review some of the guidelines for deciding whether or not the conditions you will observe are satisfactory.

CHECK THIS TABLE BEFORE RATING CO_2 CONCENTRATION

SPREADER STOKER:	10 TO 12 PERCENT
PULVERIZED COAL BURNER:	12 TO 14 PERCENT
CYCLONE FURNACES:	12 TO 14 PERCENT
RESIDUAL OIL:	12 TO 14 PERCENT
DISTILLATE OIL:	10 TO 12 PERCENT

DATA COLLECTION FORM: PULVERIZED COAL BURNER

1. RECORD PERCENT OF OPACITY HERE: ☐

RATE CONDITION OF:	CHECK ONE	
	SATISFACTORY	UNSATISFACTORY
2. STEAM FLOW	☐	☐
3. OPACITY CHART	☐	☐
4. CO_2 CONCENTRATION	☐	☐
5. FLAME CONDITION	☐	☐
6. FURNACE WALLS	☐	☐
7. FANS AND DUCT WORK	☐	☐
8. ASH DISPOSAL	☐	☐
9. CONVEYOR SYSTEM	☐	☐
10. WINDBLOWN EMISSIONS	☐	☐

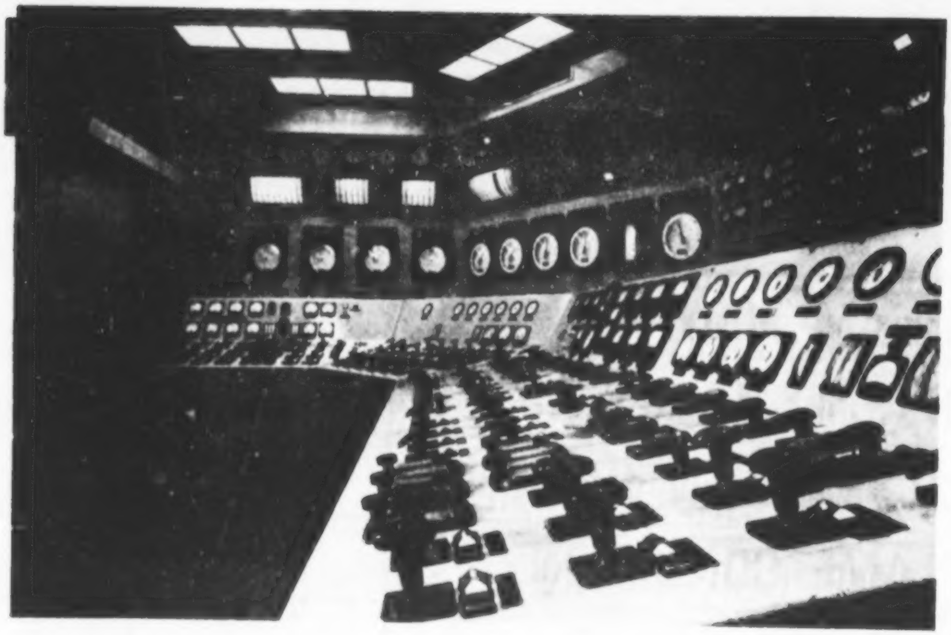


Figure 4.1 The control room

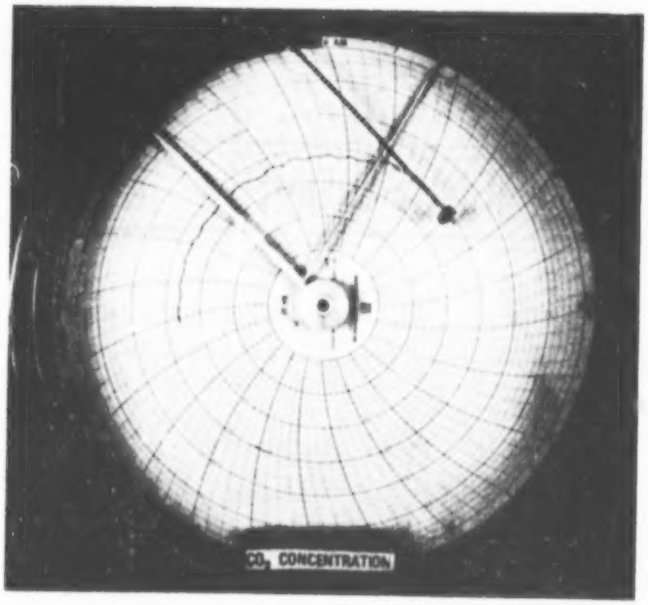

CO2 CONCENTRATION

Figure 4.2 CO_2 concentration

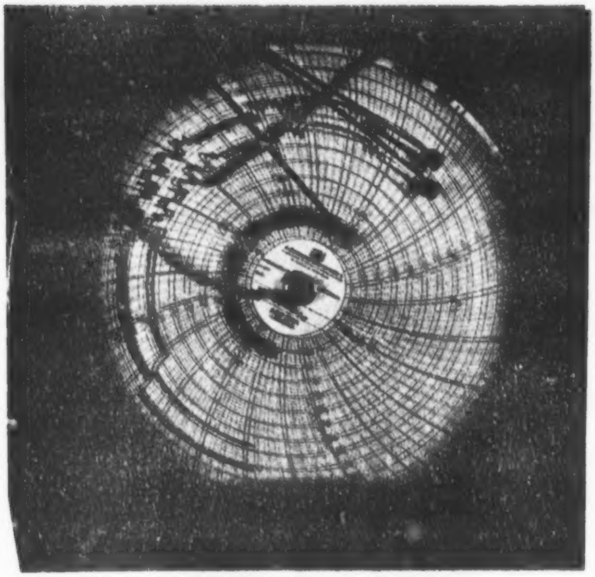


Figure 4.3 Condition of steam flow/air flow

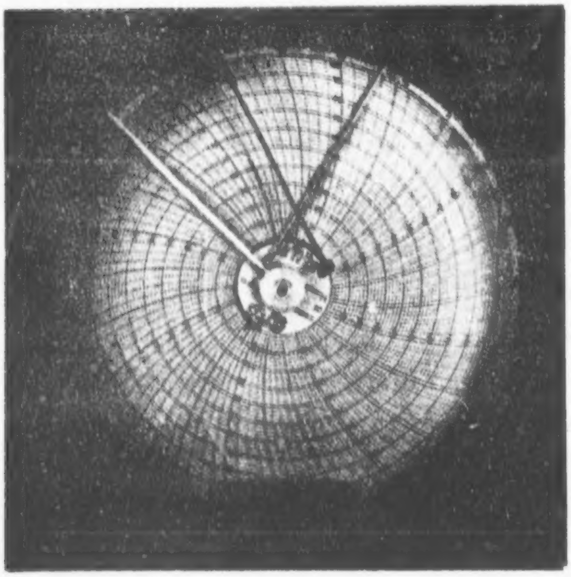


Figure 4.4 Emissions as shown by opacity chart

Figure 4.5 Slag deposits on furnace walls

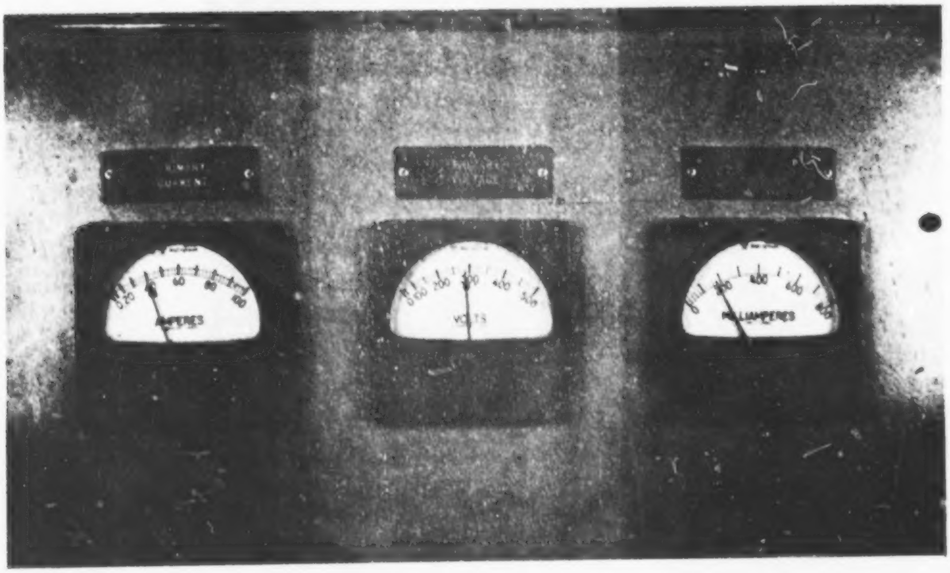

CURRENT
0 20 40 60 80 100
AMPERES
0 100 200 300 400 500
VOLTS
200 400 600 800
MILLIAMPERES

Figure 4.6 Readings on "bus section" of electrostatic precipitator

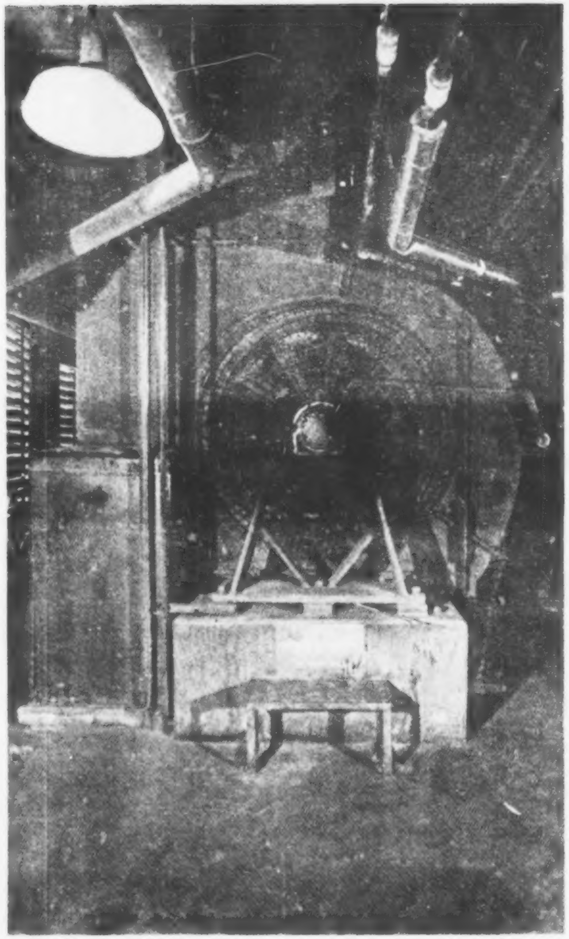


Figure 4.7 Fan and ductwork

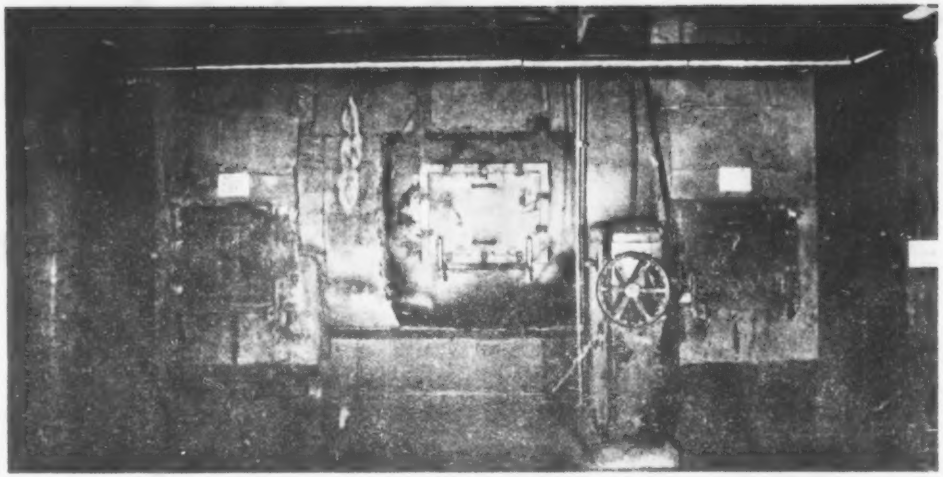


Figure 4.8 Equipment associated with the forced air fan system

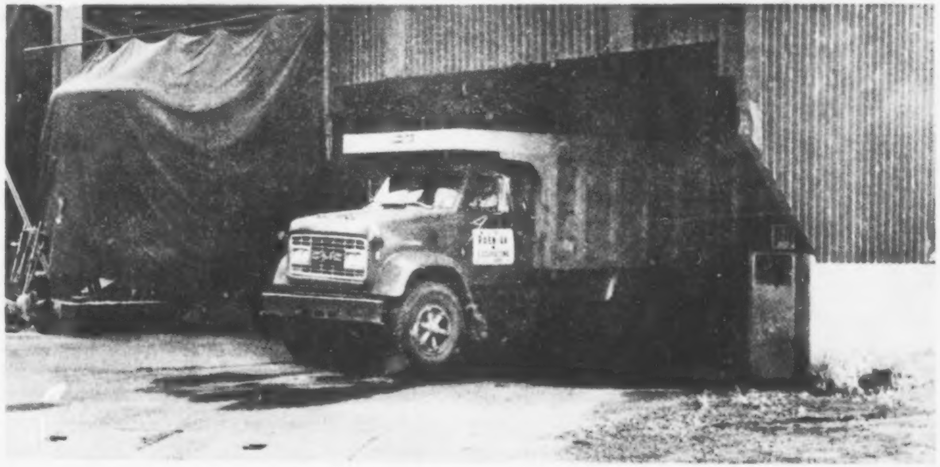


Figure 4.9 Ash dumped into truck for disposal

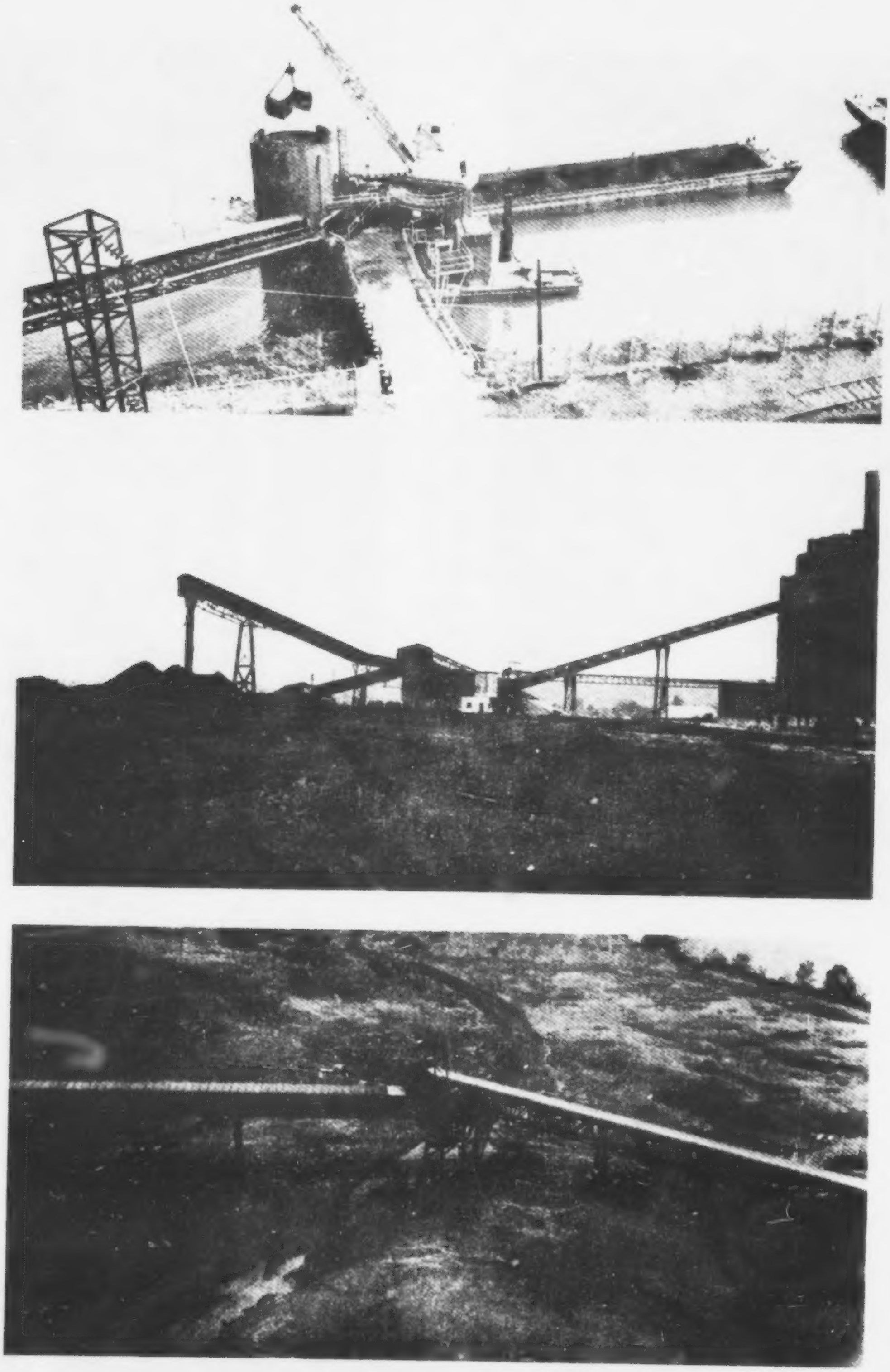


Figure 4.10 The system for coal delivery

View Part I of the Film and Complete the Data Collection Form: Pulverized Coal Burner Before Proceeding to the Next Section of this Workbook.

PART II: SPREADER STOKER FURNACE

The plant in Part II of the Film is a food processing plant. It uses a spreader stoker to generate heat for producing steam. The spreader stoker is responsive to rapid changes in load, a condition required for food processing. The air pollution control equipment are inertial separators. Multi-cyclones are the type of inertial separator used.

During the course of the Film you will be directed to perform the following inspection tasks:

1. Record opacity percentage.
2. Rate condition of flame and rate condition of fuel bed.
3. Rate condition of grates.
4. Rate condition of furnace walls.
5. Rate adequacy of fuel delivery and rate adequacy of coal size.
6. Rate condition of emissions as shown by opacity chart.
7. Rate condition of steam-flow/air-flow.
8. Rate condition of cyclone exterior.
9. Rate condition of bottom ash.

In addition, you will also observe the FEO taking a manual CO_2 reading, recording the percent of oxygen in the combustion air, and reading a pressure-drop-gauge on an inertial separator. You will rate these conditions immediately after viewing Part II of the Film:

10. Rate the CO_2 concentration.
11. Rate the O_2 level.
12. Rate pressure drop differential.

The Data Collection Form to be used while viewing the Film, and the guides for CO_2, O_2, and pressure drop are on the next two pages. Photographs of some of the inspection points follow the Data Collection Form. You may want to refer back to chapter 3 to review some of the guidelines for deciding whether or not the conditions you will observe are satisfactory.

CHECK THIS TABLE BEFORE RATING CO_2 CONCENTRATION	
SPREADER STOKER:	10 TO 12 PERCENT
PULVERIZED COAL BURNER:	12 TO 14 PERCENT
CYCLONE FURNACES:	12 TO 14 PERCENT
RESIDUAL OIL:	12 TO 14 PERCENT
DISTILLATE OIL:	10 TO 12 PERCENT

CHECK THIS TABLE BEFORE RATING O_2 LEVEL	
SPREADER STOKER:	3 TO 9 PERCENT
PULVERIZED COAL BURNER:	3 TO 6 PERCENT
CYCLONE FURNACES:	3 TO 6 PERCENT
RESIDUAL OIL:	3 TO 6 PERCENT
DISTILLATE OIL:	3 TO 6 PERCENT

CHECK THIS GUIDE BEFORE RATING PRESSURE DROP
INERTIAL SEPARATOR-2 TO 6 INCHES

DATA COLLECTION FORM: SPREADER STOKER

1. RECORD PERCENT OF OPACITY HERE: ☐

RATE CONDITION OF:	CHECK ONE	
	SATISFACTORY	UNSATISFACTORY
2. FLAME AND	☐	☐
FUEL BED	☐	☐
3. GRATES	☐	☐
4. FURNACE WALLS	☐	☐
5. FUEL DELIVERY AND	☐	☐
COAL SIZE	☐	☐
6. OPACITY CHART	☐	☐
7. STEAM-FLOW/AIR-FLOW	☐	☐
8. CYCLONE EXTERIOR	☐	☐
9. BOTTOM ASH	☐	☐

RATE CONDITIONS AFTER VIEWING FILM		
10. CO_2 =10.5%	☐	☐
11. OXYGEN=6.7%	☐	☐
12. PRESSURE DROP=2 IN.	☐	☐

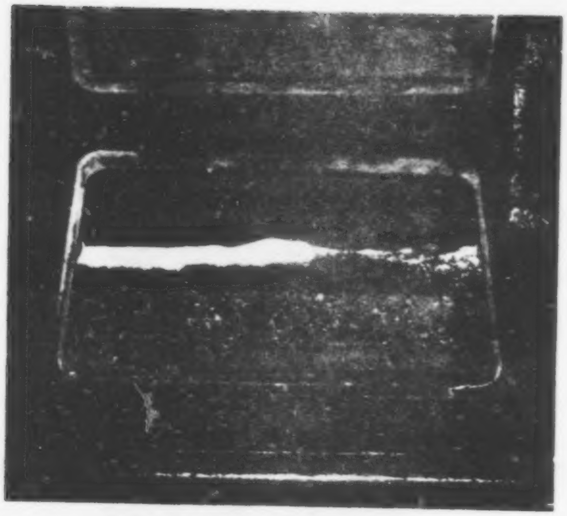


Figure 4.11 Fuel bed and flame

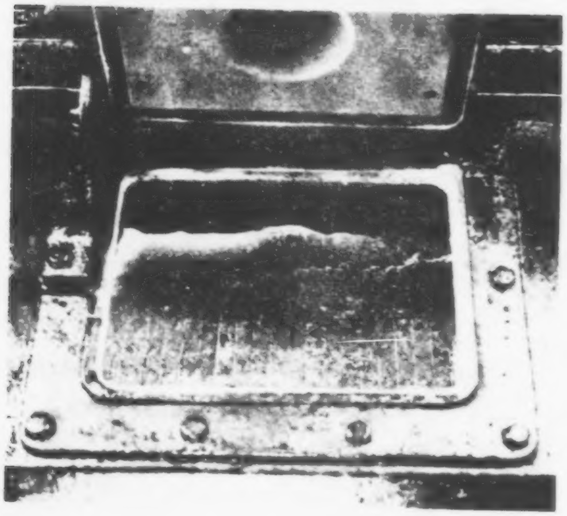


Figure 4.12 A portion of the spreader-stoker grate

Figure 4.13 Slag deposits on furnace walls

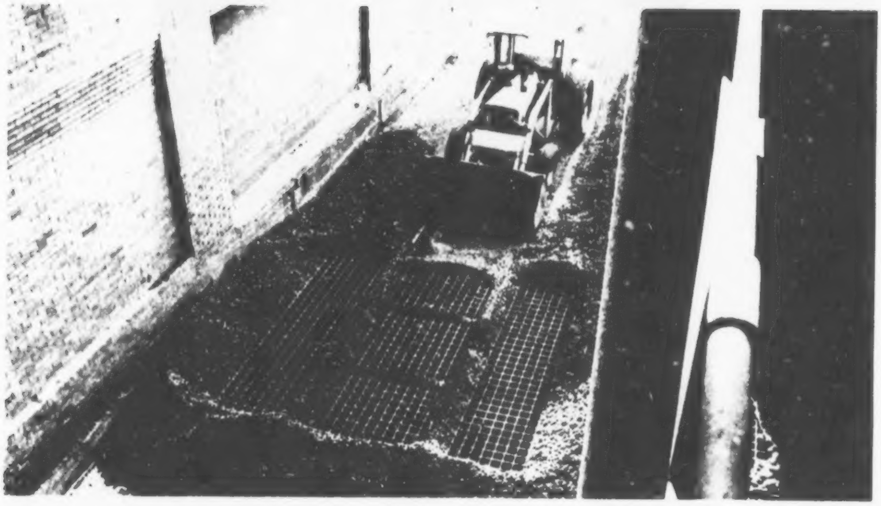


Figure 4.14 The coal delivery system

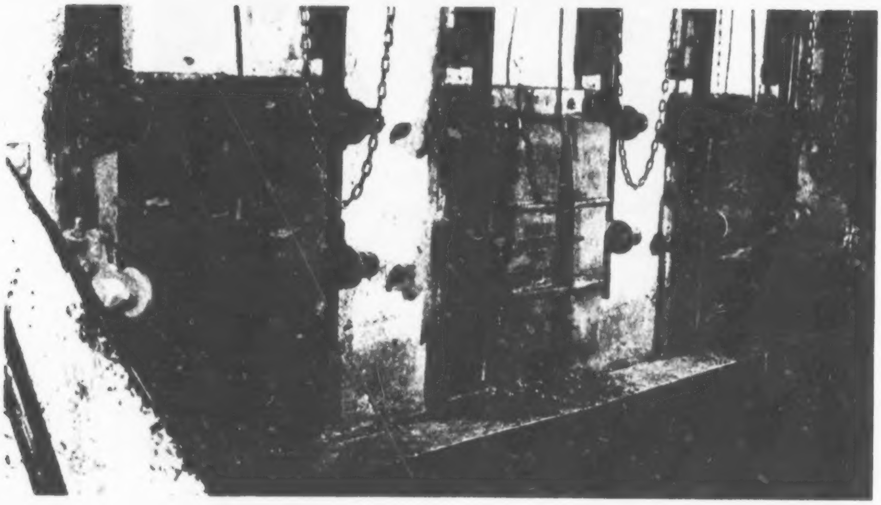


Figure 4.15 The doors to the basement ash pit

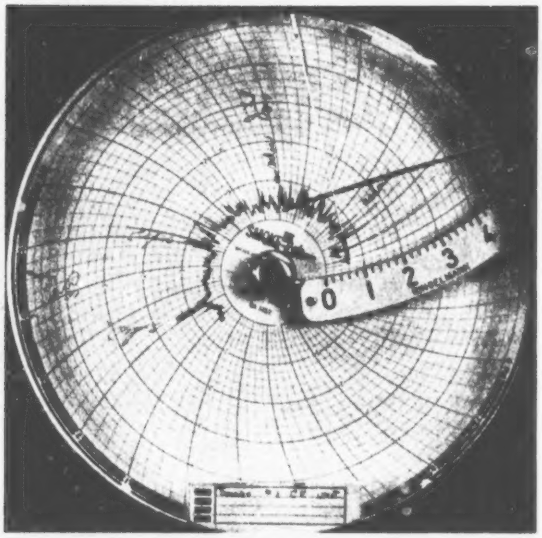


Figure 4.16 The opacity chart

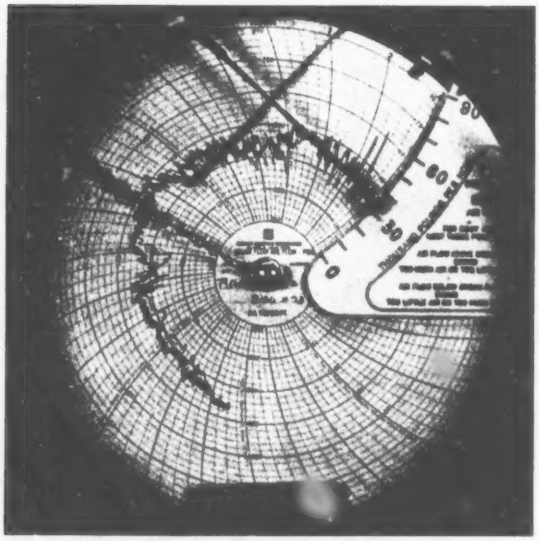


Figure 4.17 The steam flow/air flow chart

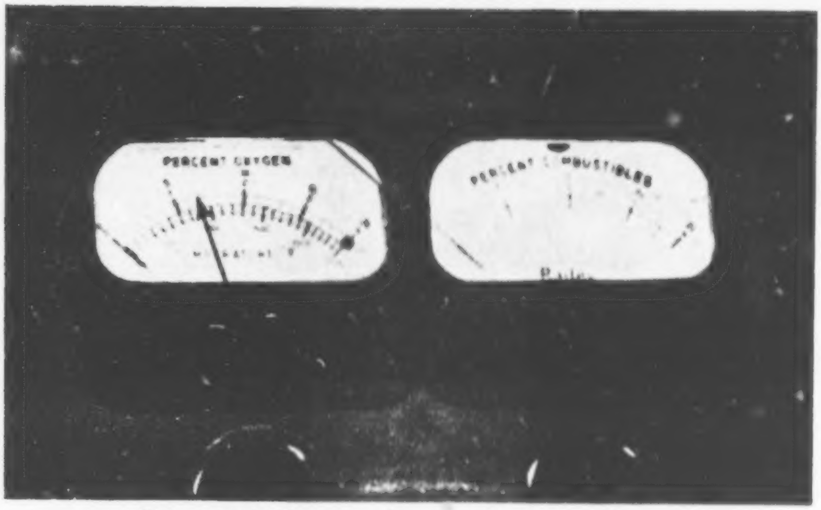

PERCENT OXYGEN
PERCENT COMBUSTIBLES

Figure 4.18 Percent of oxygen in combustion air

Figure 4.19 Pressure drop gauge for air pollution control cyclones

View Part II of the Film and Complete the Data Collection Form: Spreader Stoker Before Proceeding to the Next Section of this Workbook.

PART III: OIL BURNING FURNACE

The plant in Part III of the Film is the Mid-town Station which provides steam heat to buildings in a mid-city area. The plant uses No. 6 residual oil. The plant has no air pollution control equipment.

There are two boilers at this plant and the oxygen and opacity recorders show readings from both. Look at Figure 4.20. You will note that oxygen levels are being recorded for two boilers. You will also note that opacity levels for both boilers are being recorded on the same chart. The numbers up the side from 1 through 5 are Ringlemann numbers. A number 1 corresponds to 20 percent opacity. The air-flow/steam-flow recorder presents data for boiler number 1. The two bottom traces are the air-flow and steam-flow lines.

During the course of the Film you will be directed to perform the following five inspection tasks:

1. Record opacity percentage.
2. Rate condition of emissions as shown by opacity chart.
3. Rate condition of steam-flow/air-flow.
4. Rate condition of firebox interior.
5. Rate condition of fan.

In addition to the above, the FEO will observe several readings on the control panel which he will later compare with the original permit. After viewing the Film you will:

6. Rate the oxygen level for boiler No. 1.
7. Rate the oxygen level for boiler No. 2.

The Data Collection Form to be used while viewing the Film is on page 73. Photographs of some of the inspection points follow the Data Collection Form. You may want to refer back to chapter 3 to review the guidelines for deciding whether or not the conditions you will observe are satisfactory.

CHECK THIS TABLE BEFORE RATING O_2 LEVEL	
SPREADER STOKER:	3 TO 9 PERCENT
PULVERIZED-COAL BURNER:	3 TO 6 PERCENT
CYCLONE FURNACES:	3 TO 6 PERCENT
RESIDUAL OIL:	3 TO 6 PERCENT
DISTILLATE OIL:	3 TO 6 PERCENT

DATA COLLECTION FORM: OIL BURNING EQUIPMENT

1. RECORD PERCENT OF OPACITY HERE: ☐

RATE CONDITION OF:	CHECK ONE	
	SATISFACTORY	UNSATISFACTORY
2. OPACITY CHART	☐	☐
3. STEAM-FLOW/AIR-FLOW	☐	☐
4. FIREBOX INTERIOR	☐	☐
5. FORCED DRAFT FANS	☐	☐
AND DUCT WORK	☐	☐

RATE CONDITIONS AFTER VIEWING FILM		
6. BOILER #1: O_2 =11%	☐	☐
7. BOILER #2: O_2 =7%	☐	☐

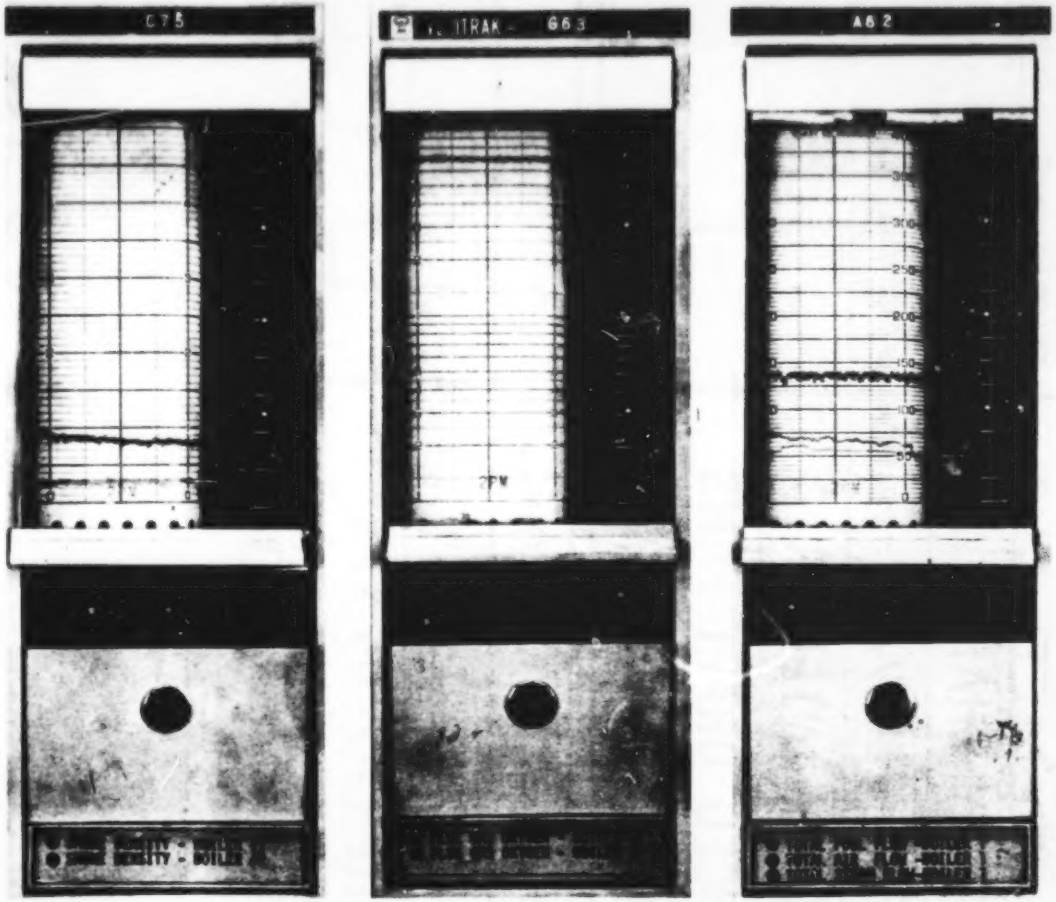

C75
TRAK - 663
A62
300
250
200
150
100
50
0

Figure 4.20 The oxygen recorder, the opacity recorder and the steam flow/air flow recorder

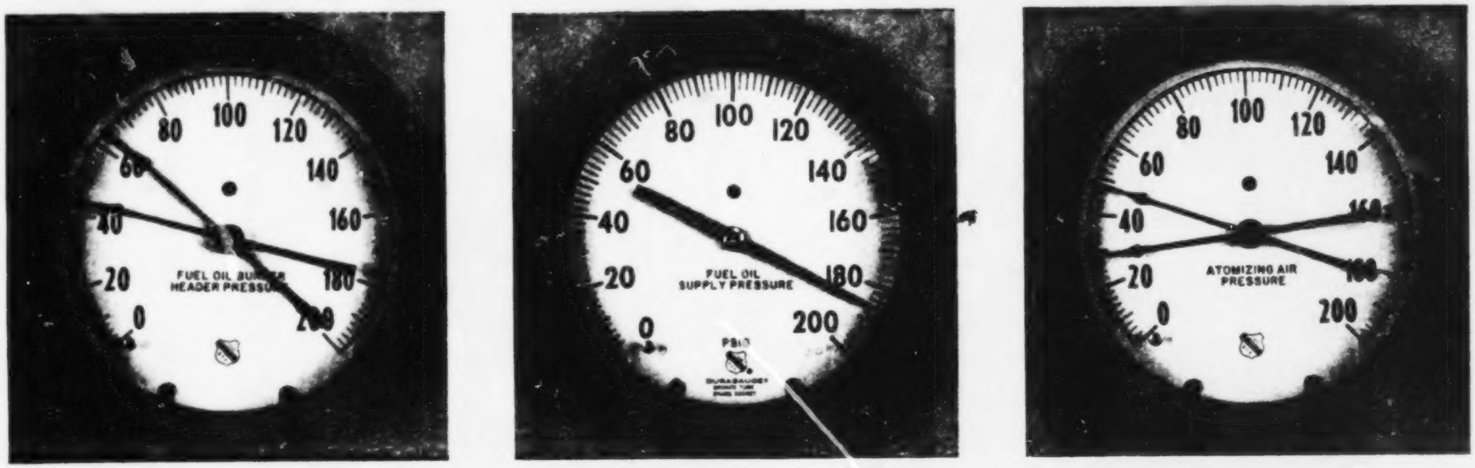
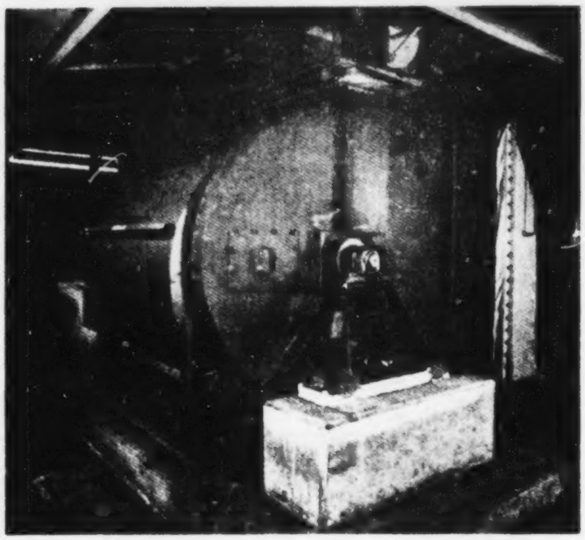

FUEL OIL BURNER
HEADER PRESSURE
FUEL OIL
SUPPLY PRESSURE
PSIG
ATOMIZING AIR
PRESSURE
0
20
40
60
80
100
120
140
160
180
200

Figure 4.21 Gauges showing conditions of the fuel delivery system



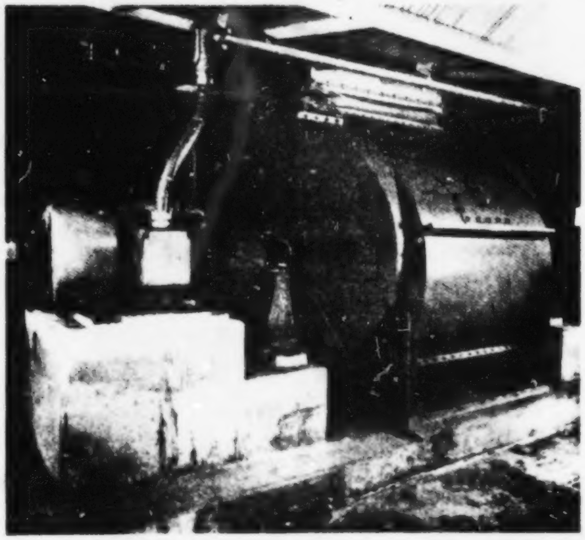


Figure 4.22 Fans and ductwork

Figure 4.23 Firebox interior

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Environmental Protection
Agency

Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park NC 27711

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Publication No. EPA-450/2-80-076

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